



ARGUS RADAR SYSTEM

Technical User Manual

ENGLISH

ARGUS
RADAR

PRO.SIMRAD-YACHTING.COM

This manual describes the following software revision:

Software Edition SWC001A001	
RELEASE DATE:	July 2011
MAIN :	ST 3.01.x
ATA	3.01.x
IOVP	3.01.x
Video Proc.	1.7/2.1
Graph. Acc.	1.3
Control Panel	16

RCS CODE/REV. INDEX	DATE	PURPOSE OF THE CHANGE	CHANGE REQUESTED BY
Revision A	September 30, 2011	First issue	N/A

OVERVIEW OF CHAPTERS

CHAPTER 1 GENERAL INFORMATION AND SAFETY PRECAUTIONS.....1.1

CHAPTER 2 GENERAL OPERATION 2.1

CHAPTER 3 RADAR PRESENTATION AND VIDEO PROCESSING 3.1

CHAPTER 4 MEASUREMENT 4.1

CHAPTER 5 TRACKING 5.1

CHAPTER 6 MAPS.....6.1

CHAPTER 7 ALARMS AND SYSTEM FAILURES 7.1

CHAPTER 8 TROUBLESHOOTING AND MAINTENANCE.....8.1

CHAPTER 9 INSTALLATION.....9.1

TABLE OF CONTENTS

1.1	Safety Precautions.....	1.1
1.1.1	High Voltage	1.2
1.1.2	Safety Switch	1.3
1.1.3	Manual Applicability	1.3
1.1.4	Purpose of the Equipment	1.3
1.1.5	Abbreviations	1.5
1.2	How to Read the System Version.....	1.9
1.2.1	Available Versions	1.10
1.3	Physical Description.....	1.10
1.3.1	Monitor Unit.....	1.10
1.3.1.1	General	1.10
1.3.1.2	Control Panel	1.10
1.3.2	CORE UNIT	1.11
1.3.3	General Functioning Description	1.11
1.3.4	Target and Data Display	1.12
1.3.5	Video Signal Processing.....	1.12
1.3.6	Failure Procedure	1.12
1.3.7	Watchdog Function.....	1.13
1.4	Technical characteristics	1.14
1.5	Other Features.....	1.20
1.5.1	Standard AC Power Supply Line	1.20
1.5.2	Mechanical Characteristics.....	1.20
1.6	System Configuration.....	1.21
1.6.1	General	1.21
1.6.2	Supported Transceivers General Specifications	1.21
1.6.3	Antenna types Technical Specifications	1.21
1.6.4	System Interfacing Definition	1.22
1.6.5	System Redundancy.....	1.22
2.1	Introduction	2.1
2.2	CONTROL PANEL and switching on System procedure	2.2
2.2.1	Control Panel Controls and Indicators	2.2
2.2.1.1	The Control Panel's three operating push-buttons (Standard key functions).....	2.2
2.2.1.2	Expanded key functions.....	2.3
2.2.2	Procedure To Switch On The System	2.9
2.3	Monitor Presentation (4:3 SYSTEM)	2.11
2.4	Monitor Presentation (Wide Screen).....	2.15

2.5	General operating procedures	2.17
2.5.1	General	2.17
2.5.1.1	GUI Widgets Description.....	2.17
2.5.1.2	Buttons	2.17
2.5.1.3	Labels.....	2.18
2.5.1.4	Shortcuts	2.18
2.5.1.5	Spin Buttons.....	2.18
2.5.1.6	Switch Buttons	2.19
2.5.1.7	List Boxes.....	2.19
2.5.1.8	Combo Boxes.....	2.20
2.5.1.9	Check Buttons	2.20
2.5.1.10	Progress Bars	2.20
2.5.1.11	Functions of the Trackball's Three Buttons.....	2.21
2.5.1.12	Focusing Function.....	2.24
2.5.1.13	Clicking in the Argus Interface	2.25
2.5.1.14	Cursor Shape	2.25
2.5.1.15	Menu Window	2.26
2.5.1.16	The numerical / alpha numerical keyboard	2.26
2.5.1.17	The Button's label	2.27
2.5.1.18	Small Menu-like Icon.....	2.27
2.5.1.19	Horizontal line with a down-oriented arrow Icon	2.28
2.5.1.20	Symbols list.....	2.28
2.5.1.21	Opening the Menu Windows.....	2.29
2.5.2	Operating Procedure Mode, Section by Section.....	2.29
2.5.2.1	Own Ship Section.....	2.29
2.5.3	Gyro & speed	2.29
2.5.3.1	Gyro Preset	2.29
2.5.3.2	Speed.....	2.31
2.5.3.3	Speed Source Selection	2.34
2.5.3.4	Manual Speed	2.34
2.5.3.5	Auto Drift Speed.....	2.35
2.5.3.6	Course.....	2.37
2.5.3.7	Latitude - Longitude	2.38
2.5.3.8	UTC or Local Time	2.38
2.5.4	AIS.....	2.38
2.5.4.1	Target Tracking.....	2.39
2.5.4.2	Target Track and AIS Association Mode	2.39

ARGUS RADAR

Contents

2.5.4.3	Map Name	2.39
2.5.4.4	Help Line Section.....	2.39
2.5.4.5	Operating Mode Section	2.39
2.5.4.6	Cursor Section	2.39
2.5.4.7	Cursor	2.40
2.5.4.8	Latitude and Longitude or ETA and TTG.....	2.40
2.5.5	CCRP Position (Consistent Common Reference Point).....	2.40
2.5.6	Parallel index menu	2.41
2.5.7	Main Menu	2.41
2.5.8	Radar Configuration.....	2.42
2.5.8.1	Personal Settings.....	2.43
2.5.8.2	Brilliance Settings	2.50
2.5.8.3	Day Color	2.51
2.5.8.4	Help Off / On	2.51
2.5.8.5	Antares PCB Info	2.52
2.5.8.6	Sharing.....	2.52
2.5.8.7	About Argus	2.53
2.5.9	ECDIS Interface Functions	2.53
2.5.10	Conning Menu.....	2.54
2.5.10.1	Task window movement	2.58
2.5.10.2	Picture in Picture.....	2.59
2.5.11	Additional PPI	2.60
2.5.11.1	Video Radar palette	2.61
2.5.11.2	Zoom	2.61
3.1	Presentation and Visualization Options Section.....	3.1
3.2	Orientation and Motion Modes.....	3.1
3.2.2	Head Up.....	3.2
3.2.3	North Up.....	3.2
3.2.4	Course Up.....	3.2
3.2.5	Relative Motion, (RM)	3.2
3.2.6	True Motion (TM)	3.3
3.2.7	P Reset / TM Reset.....	3.3
3.2.8	The Row under PPI Area.....	3.4
3.2.8.1	Range Scale Increase/Decrease	3.4
3.2.8.2	Range Rings ON/OFF	3.5
3.2.8.3	PPI Centre / Off centre	3.5
3.2.8.4	P Reset/TM Reset.....	3.5

3.2.8.5	Gnd Stab / Sea Stab	3.5
3.2.8.6	Heading Line and PPI graphics On / Off.....	3.5
3.2.8.7	Tune	3.6
3.3	Video Processing Section	3.7
3.3.1	Gain.....	3.7
3.3.2	Video Level Equalization.....	3.8
3.3.3	Rain	3.8
3.3.3.1	Manual and Auto-rain.....	3.8
3.3.3.2	Loss of detection caused by rain clutter.....	3.9
3.3.4	Sea	3.9
3.3.5	Advanced video processing	3.12
3.3.6	Scan to Scan Correlation	3.13
3.3.7	Interference Rejection	3.14
3.3.8	Mutual Radar Interference	3.16
3.3.9	Second Trace Echo.....	3.16
3.3.10	Sweep to Sweep Correlation	3.17
3.3.11	Target Enhancement.....	3.17
3.4	SART (Search and Rescue Transponders) Video Presentation	3.17
3.5	RACON (Radar Beacon) Video Presentation	3.20
3.6	Video Processing Menu	3.21
3.6.1	Which Preset is the right one ?	3.23
3.7	TXRX Interswitch menu (standard).....	3.24
3.7.1	Master / Slave	3.24
3.7.2	Performance Monitor ON / OFF	3.25
3.7.3	Power Normal / Boost	3.26
3.7.4	TXRX Data	3.27
3.7.5	Standard Speed	3.27
3.8	TXRX Interswitch Menu (Configuration Video Combination).....	3.28
3.8.1	Tracking and Video Processing operation in combination and 2 nd PPI mode	3.29
3.8.2	A or B Combination	3.30
3.8.3	A and B Combination	3.30
3.8.4	Sector Combination.....	3.31
3.8.5	A and/or B Combination	3.32
4.1	Radar echo measurement	4.1
4.1.1	Measurement by means of Range Rings and Bearing Scale	4.1
4.1.2	Measurement by means of the Cursor.....	4.1
4.1.3	Measurement by means of the ERBL 1 or 2.....	4.2

4.2	More Target Data Measurement.....	4.3
4.3	Cursor section.....	4.4
4.3.1	Cursor	4.4
4.3.2	Latitude and Longitude or ETA and TTG.....	4.4
4.4	ERBL 1 and 2.....	4.4
4.5	Parallel Indexes	4.6
4.5.1	Range Rings	4.8
5.1	General information	5.1
5.1.1	Radar Target Tracking Facility.....	5.1
5.1.1.1	General	5.1
5.1.1.2	Tracking Error Sources and Effects.....	5.1
5.1.1.3	Sea, Rain, Snow and Low Clouds Returns	5.1
5.1.1.4	Radar Interference.....	5.2
5.1.1.5	Sidelobe Echoes.....	5.2
5.1.1.6	Blind Sectors.....	5.3
5.1.1.7	Low Signal to Noise Ratio and Signal to Clutter Ratio	5.3
5.1.2	Tracking operation in 2 nd PPI zone and under video combination mode.	5.3
5.1.3	AIS (Automatic Identification System)	5.4
5.1.3.1	General	5.4
5.1.3.2	The System Advantages.....	5.5
5.1.3.3	Operating	5.5
5.1.4	Tracking Target Symbols.....	5.6
5.1.4.1	Operating with the Radar target.....	5.8
5.1.4.2	Operating with the AIS target.....	5.9
5.1.4.3	AIS ship outline viewing conditions.....	5.11
5.2	Target overload.....	5.12
5.3	Radar target trails	5.12
5.4	Past Positions	5.13
5.5	Vector Time.....	5.14
5.6	True / Relative Vector	5.14
5.7	Tracking menu	5.15
5.8	Anchor Watch	5.16
5.9	Training Target.....	5.16
5.10	Cancel All TGT.....	5.17
5.11	Minimum Safety Menu	5.17
5.12	Auto-Acquisition Zone.....	5.17
5.13	Guard zones / auto acquisition zones.....	5.18

5.14	Trial Manoeuvre	5.20
5.15	Manual Trail Manoeuvre	5.21
5.15.1	Automatic Trial Manoeuvre	5.22
5.16	AIS and RADAR target Association	5.28
5.17	AIS ON / OFF	5.29
5.18	AIS List.....	5.30
5.19	TT Target List.....	5.30
5.20	AIS Limit Priority.....	5.31
5.21	AIS Filtering.....	5.31
5.22	AIS Options	5.32
5.23	Symbol.....	5.32
5.23.1	TT, AIS and Navigation Symbols	5.33
5.23.2	Route Presentation and Waypoints Data.....	5.34
5.24	Displaying target information	5.35
6.1	General	6.1
6.2	Create a new Map.....	6.2
6.3	Operating with a selected Video Map	6.7
6.4	Editing Objects on the Video Map.....	6.8
6.5	Geographic Map Manual Settings Menu.....	6.10
6.5.1	Selection and Movement with the trackball cursor	6.11
6.5.2	Selection and Movement by means of the editable labels and buttons.....	6.13
6.6	Import and export a map	6.15
7.1	System Status	7.2
7.1.1	Keyboard Test.....	7.3
7.2	Alarm List	7.3
7.2.1	Audio On/Off	7.5
7.3	Radar Presentation FAILURE.....	7.5
8.1	Introduction	8.1
8.2	Troubleshooting	8.1
8.2.1	General	8.1
8.2.2	Personnel	8.1
8.2.3	Tools and Instruments.....	8.1
8.3	Troubleshooting Procedures.....	8.2
8.3.1	Safety Precautions	8.2
8.3.2	Troubleshooting Operations.....	8.2
8.4	Corrective Maintenance	8.8
8.4.1	Introduction	8.8

8.4.2	Safety Precautions.....	8.8
8.4.3	Personnel.....	8.8
8.4.4	Required Tools and Instruments.....	8.8
8.5	Corrective Maintenance Procedures	8.9
8.6	Corrective Maintenance Procedures on the Core unit.....	8.9
8.6.1	CORE UNIT Cover Removing and Installation	8.9
8.6.2	ALPHA Expansion Board Replacement (optional)	8.9
8.6.3	ANTARES Assy Replacement.....	8.10
8.6.4	ALPHA Board Replacement	8.10
8.6.5	Line Filter Replacement.....	8.10
8.6.6	P.S. Assy Replacement	8.11
8.7	Corrective Maintenance Procedures on the Monitor Unit.....	8.18
8.8	Corrective Maintenance Procedures on the Keyboard Unit	8.18
8.8.1	Keyboard Unit Cover Removing and Installation	8.18
8.8.2	Keyboard Replacement	8.18
8.8.3	Trackball Replacement	8.18
8.8.4	Keyboard Panel Replacement.....	8.19
8.9	Parts List.....	8.20
8.9.1	Introduction	8.20
8.9.2	Parts List.....	8.20
8.9.3	Part Location Illustration	8.20
8.9.4	Parts List Tables	8.21
8.9.5	System's Lifetime.....	8.23
9.1	Introduction	9.1
9.1.1	Shipping	9.1
9.1.2	Unpacking.....	9.1
9.1.3	Storage	9.2
9.1.4	Handling.....	9.2
9.2	System specifications	9.3
9.2.1	Dimensions and weights.....	9.3
9.2.2	Power.....	9.3
9.2.3	Environmental Data	9.3
9.3	Interface Requirement	9.4
9.3.1	Input/Output Requirements.....	9.4
9.4	Guidelines for the installation of shipborne radar equipment	9.7
9.4.1	Interference	9.7
9.4.2	Location relative to masts, funnels and other constructions.....	9.7

ARGUS RADAR

Contents

9.4.3	Blind sectors and range	9.7
9.4.4	Interaction with sea and false echoes.....	9.8
9.4.5	Cables and grounding	9.9
9.4.6	Radar controls and display	9.9
9.5	ARGUS DISPLAY serial interface specification.....	9.10
9.5.1	Serial Line 1	9.10
9.5.2	Serial Line 2	9.11
9.5.3	Serial Line 3	9.15
9.5.4	Serial Line 4	9.29
9.5.5	Serial Line 5	9.30
9.5.6	Serial Line 6	9.31
9.5.7	Serial Line 7	9.32
9.6	Installation	9.34
9.6.1	Installation Principles	9.34
9.6.2	Mechanical installation	9.34
9.6.3	Electrical installation.....	9.34
9.6.3.1	Power Supply Cable.....	9.34
9.6.3.2	Keyboard Cable	9.34
9.6.3.3	DVI Cable.....	9.34
9.6.3.4	Monitor Power Cable.....	9.34
9.6.3.5	Grounding	9.35
9.6.3.6	Installation Check-out.....	9.35
9.7	Installation pictures and drawings.....	9.35

CHAPTER 1

GENERAL INFORMATION AND SAFETY PRECAUTIONS

1.1 SAFETY PRECAUTIONS

The ARGUS RADAR is connected to 115 VAC or 220 VAC - 50 or 60 Hz power; therefore, before starting any work on the equipment, make sure that the power supply is switched off.

The system is equipped with fuses protecting the electronics devices from short circuits, which may damage the equipment or cause fire.

Depending upon the material to be highlighted, the following attention headings are used in this manual.

DANGER

BEFORE TURNING ON THE RADAR, MAKE SURE THAT NO ONE IS STANDING NEAR THE ANTENNA.

WARNING

THE ELECTRONICS OF THE EQUIPMENT ARE SUPPLIED WITH MAINS POWER, ALSO WHEN THE EQUIPMENT IS SWITCHED OFF. FOR THIS REASON, OPENING A UNIT MUST BE PERFORMED ONLY BY SKILLED PERSONNEL.

WARNING

AN OPERATING OR MAINTENANCE PROCEDURE, PRACTICE, CONDITION AND STATEMENT WHICH, IF NOT STRICTLY OBSERVED, COULD RESULT IN INJURY TO PERSONNEL OR DEATH.

WARNING

An operating or maintenance procedure, practice, condition and statement which, if not strictly observed, could result in damage to, or destruction of, the system or reduced performance.

NOTE

An essential operating or maintenance procedure, condition or statement, which must be noticed.

WARNING
Microwave Radiation Levels

Unit Configuration	TXRX/ Pedestal	Antenna	100 W/m ² Power density distance (m)	50 W/m ² Power density distance (m)	10 W/m ² Power density distance (m)
12 kW X-Band + 6' X Band Antenna	Argus 12U	6 ft. X-band	-	0.15	0.6
12 kW X-Band + 9' X Band Antenna	Argus 12U	9 ft. X-band	-	-	0.5
12 kW X-Band + 12' X Band Antenna	Argus 12U	12 ft. X-band	-	-	0.35
25 kW X-Band + 6' X Band Antenna	Argus 25U	6 ft. X-band	0.1	0.2	1.3
25 kW X-Band + 9' X Band Antenna	Argus 25U	9 ft. X-band	-	0.1	1
25 kW X-Band + 12' X Band Antenna	Argus 25U	12 ft. X-band	-	0.05	0.9

When a precaution, which relates specifically to a part of the technical manual is required, the information is given in the relevant part of the manual.

Warnings and Cautions precede applicable text.

1.1.1 High Voltage

Radar equipment includes high voltage that can cause injury or loss of life. Danger exists only when the units are opened exposing internal circuits, as when servicing the equipment. The ARGUS Radar has been carefully designed to protect personnel from possible injury from high voltages.

Nevertheless, it is recommended that the Main Power Line shall always be OFF as an added protection when inspecting or servicing the equipment.

Although every effort has been made to eliminate danger to personnel, no responsibility is accepted for any injury or loss of life suffered in connection with this equipment.

1.1.2 Safety Switch

The Radar Unit is provided with a safety switch, which disables the Antenna rotation during maintenance and avoids high voltage damage. Always turn the safety switch off, whenever advised in this manual (for instance, before performing any maintenance or installation procedure). Ignoring safety switch operation may produce hazard of electrocution as well as other severe injuries.

1.1.3 Manual Applicability

The present user manual provides information, data and procedures relevant to the general description, operation, functional description, scheduled maintenance, troubleshooting, repair, replaceable parts list and installation of the ARGUS RADAR.

The contents of the present user manual are arranged in chapters according to the following:

Chapter 1 - General Information and Safety Precautions

Chapter 2 - General Operation

Chapter 3 - Radar Presentation and Video Processing

Chapter 4 - Measurement

Chapter 5 - Tracking

Chapter 6 - Maps

Chapter 7 - Alarms and System Failures

Chapter 8 - Troubleshooting and Maintenance

Chapter 9 - Installation

Error! Reference source not found. - Error! Reference source not found.

NOTE This manual is for study purposes only. Schematics with radar set may be different from those enclosed.

1.1.4 Purpose of the Equipment

The ARGUS RADAR is a radar indicator with a presentation based on a raster scan principle. The advantages of using the raster scan principles to produce a radar display are as follows:

- true daylight presentation;
- continuous display of radar video;
- high number of graphics that can be superimposed to the radar picture;
- areas where all necessary navigational data can be presented at the same time.

Over a total of 360° the radar scans the horizon, and up to 8192 azimuth samples are converted and stored in a memory and then presented on a raster scan display. These conversion and memory logic make the core (heart) of the indicator.

In order to have a display resolution similar or better as compared to a traditional radar picture, very large memories are used. In addition, the display monitor is able to present video data without losing even the smallest information written into the memory.

In order to reduce the number of circuit boards (PCB's), a CPU performs multiple functions. Therefore, the CPU has the total control of the system and gives the advantage to have very sophisticated diagnostics and great flexibility.

Very large scale integrated micrologics are used.

A single card forms a complete sub-function and has very few connections to the rest of the system.

The modular design in the base of the system and sub-units are easily replaced in case of malfunction.

The ARGUS RADAR performs the following operations:

- it receives the ship sensors data, which are:
 - . GYRO: it indicates the ship course
 - . LOG: it indicates the ship speed
 - . EPFS: it indicates the ship position;
 - . AIS: it identifies the ships in the area
- it interfaces and receives signals from up to four transceivers (scanners), with relevant antenna, and allows the operator to select the transceiver to be used for the presentation;
- it processes the received signal in order to detect targets;
- it processes the signal relevant to a target in order to obtain the target data: position, speed, course, heading;
- it automatically tracks a target in order to update the target data;
- it shows the target position on the monitor.

WARNING

According to the IMO standard a ground speed sensor is required to be connected to the Argus system.

It is allowed to use an electronic position fixing system (EPFS) approved in accordance with the requirements of the IMO in resolution MSC.112 (73) or an alternative two dimensional ground stabilising SDME in compliance with IMO resolution MSC.96 (72)

1.1.5 Abbreviations

Very often navigation related information is presented using the standard terms or abbreviations. In the following table you will find the most common abbreviations and the ones used in this manual.

TERM	ABBREV.
Acknowledge	ACK
Acquire	ACQ
Adjust	ADJ
Automatic Identification System	AIS
Alarm	ALARM
Anchor Watch	ANCH
Antenna	ANT
Autopilot	AP
Automatic Radar Plotting Aid	ARPA
Audible	AUD
Available	AVAIL
Acquisition Zone	AZ
Azimuth Indicator	AZI
Bow Crossing Range	BCR
Bow Crossing Time	BCT
Background	BKGND
Bearing	BRG
Display Brilliance	BRILL
Bearing Waypoint to Waypoint	BWW
Constant Common Reference Point	CCRP
Centre	CENT
Constant False Alarm Ratio	CFAR

TERM	ABBREV.
Cancel	CNCL
Course Over Ground	COG
Contrast	CONT
Closest Point Of Approach	CPA
Central Processing Unit	CPU
Course	CRS
Course To Steer	CTS
Course Up	C UP
Cursor	CURS
Day/Night	DAY/NT
Decrease	DECR
Degrees	DEG
Delete	DEL
Differential GPS	DGPS
Display	DISP
Distance	DIST
Depth	DPTH
Dead Reckoning	DR
Digital Selective Calling	DSC
Deep Water	DW
Electronic Bearing Line	EBL
Electronic Chart Display Information System	ECDIS

TERM	ABBREV.
Electronic Chart System	ECS
European Geo-Stationary Navigational Overlay System	EGNOS
Automatic Navigational Chart	ENC SOG
Estimated Position	EP
Electronic Position Fixing System	EPFS
Emergency Position Indicating Radio Beacon	EPIRB
Equipment	EQUIP
Range and Bearing Line	ERBL
Estimated Time of Arrival	ETA
Estimated Time of Departure	ETD
Exclusion Zone	EZ
Function Key	FK
Forward	FWD
Grounding Avoidance System	GAS
Geographic	GEOG
Global Orbiting Navigation Satellite System	GLONASS
Global Maritime Distress and Safety System	GMDSS
Ground Stabilised	GNDSTAB
Ground Track	GND TRK

TERM	ABBREV.
Global Navigation Satellite System	GNSS
Global Positioning System	GPS
Gyro	GYRO
Guard Zone	GZ
Heading	HDG
Heading Line	HL
Hours	HR
Head Up	H UP
Integrated Bridge System	IBS
Identification	ID
Input	IN
Initialisation	INIT
Integrated Navigation System	INS
Input/Output	I/O
Interference Rejector	IR
Integrated Radio Communication System	IRCS
Interswitch	ISW
Kilometre	Km
Knots	KN

TERM	ABBREV.
Label	LBL
Limit	LIM
Lost Target	LOST TGT
Long Pulse	LP
Metres	M
Maps	MAP
Minimum	MIN
Minutes	MIN
Marker	MKR
Maritime Mobile Service Identity	MMSI
Man Overboard	MOB
Medium Pulse	MP
Master	MSTR
Navigation	NAV
Normally Closed	NC
Not Less Than	NLT
Nautical Mile	NM
Not More Than	NMT
Not Under Command	NUC
North Up	N UP
Off Centre	OFF CENT
Off Track	OFFTRK
Own Ship	OS
Output	OUT
Route	RTE

TERM	ABBREV.
Predicted Area of Danger	PAD
Past Positions	PAST POSN
Printed Circuit Board	PCB
Parallel Index Line	PI
Pulse Length	PL
Performance Monitor	PM
Position	POSN
Predicted Point of Collision	PPC
Pulse Repetition Frequency	PRF
Power	PWR
Radius	RAD
Relative Bearing	R BRG
Raster Chart Display System	RCDS
Relative Course	R CRS
Echo Reference	REF
Echo Reference Speed	REF SOG
Relative	REL or R
Relative Motion	RM
Relative Motion (Relative Trails)	RM (R)
Relative Motion (True Trails)	RM (T)
Raster Navigational Chart	RNC
Range	RNG
Rate Of Turn	ROT
Range Rings	RR
Safety Contour	SAF CON

TERM	ABBREV.
Relative Vector	R VECT
Receiver	RX
Safety Contour	SAF CON
Search And Rescue	SAR
Scan to Scan	SC/SC
Select	SEL
System Electronic Navigational Chart	SENC
Speed and Distance Measuring Equipment	SDME
Soft Key (trackball buttons)	SK
Signal to Noise Ratio	SNR
Speed Over Ground	SOG
Self Organising Time Division Multiple Access	SOTDMA
Short Pulse	SP
Speed	SPD
System Raster Navigational	SRNC
Small Radar Transceiver	SRT
Stabilised	STAB
Starboard	STBD
Standby	STBY
Sensitive Time Control	STC
Speed Through Water	STW
True Bearing	T BRG
Time to Closest Point of Approach	TCPA
True Course	T CRS

TERM	ABBREV.
Target	TGT
True Motion	TM
Transponder	TPR
Trial Manoeuvre	TRIAL
Trigger Pulse	TRIG
Track	TRK
Tracking	TRKG
True Speed	T SPD
Time To Go	TTG
True Vector	T VECT
Time to Wheel Over Line	TWOL
Transmit	TX
Transmitter	TX
Transceiver	TX/RX
Uninterruptible Power Supply	UPS
Variable Range Marker	VRM
Vessel Traffic Services	VTS
Wheel Over Line	WOL
Wheel Over Point	WOP

1.2 HOW TO READ THE SYSTEM VERSION

The function of the System Version menu is to recognise the Program and the Version running within the System.

To display the System Version:

1. Open the MENU by pressing the relevant button
2. Press the About Argus button.

This Menu summarises all the programs running within the System

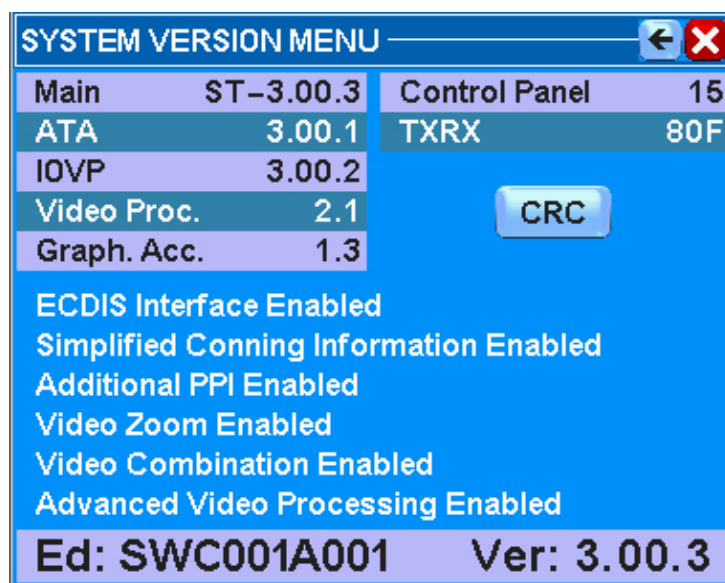


Figure 1.2 System Parameter – System Version Window

1.2.1 Available Versions

The system can be configured with different additional functions according to the monitor being used:

MONITOR	FUNCTIONS					
	Video Combination	Simplified Conning information	Additional PPI	ECDIS interface	Zoom	Advanced video processing
19"	•			•		•
23"	•			•	•	•
27"	•	•	•	•	•	•

To better understand the different functions, see the following paragraphs:

- | | |
|-----------------------------------|----------------|
| 1. Video Combination | parag.3.8.2 |
| 2. Simplified Conning information | parag.2.5.10 |
| 3. Additional PPI | parag.2.5.11 |
| 4. ECDIS interface | parag.2.5.9 |
| 5. Zoom | parag.2.5.11.2 |
| 6. Advanced video processing | parag.3.3.5 |

1.3 PHYSICAL DESCRIPTION

The ARGUS Radar System consists of the following units (Figure 8.9.1):

- Monitor Unit (pos. 1) on which the data, command buttons inside the SYSTEM DATA AREA, and the echoes with relevant targets inside the PPI AREA are displayed.
- CORE UNIT (pos. 2) in which the ARGUS electronic boards are mounted.
- KEYBOARD UNIT (pos. 3) on which the hardware of the Control Panel is mounted.
- SCANNER UNIT – not included. Refer to Simrad Argus Radar Scanner – Technical Manual.

1.3.1 Monitor Unit

1.3.1.1 General

The ARGUS Monitor Unit (Figure 8.9.1, pos. 1) represents the visual interface between the Operator and the Equipment. The equipment can be supplied with two different types of Monitor Unit. Technical characteristics are in the Technical Manual and in the following paragraph.

1.3.1.2 Control Panel

The Control Panel is the interface on which the operator can insert data, change the working parameters and perform the operations necessary for a correct use of the equipment.

The Control Panel features light indicators, push-buttons and a trackball, which controls the equipment. For more details, refer to Chapter 2.

The Control Panel is connected to the CORE UNIT by means of a cable with connector.

1.3.2 CORE UNIT

The CORE UNIT (Figure 9.7.5) consists of the following main parts protected in a dedicated cabinet::

- the Antares Assy (pos. 3 Figure 8.6.3)
- the Alpha Board (pos. 2 Figure 8.6.4)
- the optional Alpha Expansion Board (pos. 2 Figure 8.6.2)
- the Power Supply mounted on the Alpha Board
- the Line Filter (pos. 2 Figure 8.6.5)
- the Main Power Switch (pos. 3 Figure 8.6.5)

The boards are made up of multi-layers printed circuit using VLSI components; programmable gate arrays and microprocessors are used to achieve a high package density, functional reliability and low power consumption.

Auxiliary indicators (Light Emitting Diodes) are also located on the boards to allow easy scheduled test and troubleshooting and maintenance actions.

The Line Filter is fixed to the left lateral panel of the DISPLAYCORE UNIT by means of nuts. The supply voltage (115 VAC – 220 VAC 50/60 Hz) is applied through the Main Power Switch to the Alpha board.

The Alpha Board is fixed on the left side of the CORE UNIT by means of screws. The board is the interface between the ARGUS monitor, auxiliary navigation equipment (GYRO, GPS, LOG, AIS...) and the TXRX's (transceivers) connected. The interconnection allows commands to be transmitted or received through BNC connectors and the Terminal Connectors.

1.3.3 General Functioning Description

The ARGUS monitor receives the following signals from the connected transceiver(s):

- Video Signal
- Trigger
- Azimuth (AZ)
- Heading Line (HL)
- TXRX Data

The data is applied to the TXRX INTERFACE block of the Alpha board that, upon command from the MAIN PROCESSOR on the Antares board, selects the transceiver to be used. The signals from the selected transceiver represent the data on which the equipment operates.

The signal process mainly consists of two steps:

- the Video Signal Processing
- the Automatic Target Tracking

The results of the signal processing are both visualised on the Monitor and sent to the Automatic Target Tracking circuits.

1.3.4 Target and Data Display

The Monitor presentation area is subdivided in a radar video presentation called PPI AREA and a data table SYSTEM DATA AREA (for more details, refer to Chapter 2). On standard version, the total area of the screen is made up of a rectangle of 1280x1024 pixels or 1600x1200 pixels depending of the display size. The video signal and the graphic symbols (vectors, arcs, special symbols, bearing scale and segments) are represented within the area of the PPI.

1.3.5 Video Signal Processing

This section receives the Video Signal from the transceiver and, after conversion into digital form, processes it by removing:

- Sea Clutter
- Rain Clutter
- Interference

The processed signal is sent to:

- the Monitor for visualisation
- the Automatic Target Tracking circuits

In the Video Signal Processing blocks, the digital signal is processed by means of complex algorithms in order to recognise the presence of a target and, if the target is present, its shape and the target co-ordinates.

The target co-ordinates and the target shape are sent, in digital form, to the Automatic Tracking Section of the equipment.

1.3.6 Failure Procedure

This description does not describe failures that can occur during operation. If a failure occurs, the operator must perform all relevant actions in order to remove the failure itself. When a failure occurs, the fail condition is pointed out by:

- the red SYSTEM FAIL LED
- the acoustic alarm
- the Fail System Warning will be displayed in the General Purpose Section

1.3.7 Watchdog Function

WARNING

THE EQUIPMENT OPERATIONAL SOFTWARE IS MONITORISED BY A HARDWARE WATCHDOG WITH A 3 s TIMEOUT.

Non recoverable errors due to hardware faults are indicated by FAIL indication on the Control Panel flashing at approximately 1 Hz.

Any type of failure caused by software or hardware, which stops the system for more half a second activates the System Failure relay on the Alpha PCB. This check doesn't need software intervention, but is automatically controlled by the hardware. The Failure relay contact is normally closed, so the function is active, also when the main line is absent or the power supply has failed.

1.4 TECHNICAL CHARACTERISTICS

1	GENERAL DESCRIPTION
	The ARGUS radar fully complies and exceeds IMO recommendations. The ARGUS radar is composed of the scanner unit and three modules i.e. a desk-mounted Monitor Cabinet, Keyboard and Core Unit. Thanks to the modular design, it can be assembled to form a stand-alone display cabinet or may be flushmounted into a mechanical bridge console. The standard basic configuration always includes an electronic, built-in Interswitch for dual radar installation. The above flexibility makes the ARGUS radar the optimum solution for a dual radar system on new constructions and retrofit installations.

2	ARGUS radar	Actual radar picture (mm)	Resolution (pixels)	Category of ship/craft
	Monitor size: 19"	> 250 (mm)	1280 x 1024	CAT2/CAT2H
	Monitor size: 23"	> 320 (mm)	1600 x 1200	CAT1/CAT1H
	Monitor size: 27"	> 320 (mm)	1920 x 1200	CAT1/CAT1H

3	TECHNICAL SPECIFICATIONS	
	Video processing:	– Digital processing on: 8 bit (256 levels) – Manual /Automatic Sea anti-clutter and rain anti-clutter. – Sweep to sweep (Interference Rejection), scan to scan video correlation for residual sea clutter removal, target enhancement. – Scan to scan correlation for echo trails. True and relative trails calculated simultaneously in every presentation mode. Trails are maintained between changes in range scale and PPI position.
	Presentation modes:	Day/night modes
	- Relative motion (RM)	Head up, Course up and North up
	- True motion (TM):	Course up and North up
	Off-centering:	Up to 50 % of range scale in use.
	Range scales:	0.25, 0.5, 0.75, 1.5, 3, 6, 12, 24, 48, 96
	Range rings:	0.05, 0.1, 0.25, 0.75, 0.5, 1, 2, 4, 8, 16
	Range resolution:	3 m on 0,75 NM range scale
	VRM	Dual VRM from 0 to 96 NM with digital readout
	VRM resolution:	0,01 NM
	VRM accuracy:	1% of range scale in use
	Azimuth resolution:	0,1°
	EBL:	Dual EBL with independent 0-360° true or relative digital readout
	EBL resolution:	0,1°
	Trackball:	Polar and Geographic coordinates continuously displayed
	Diagnostics:	On-line diagnostic built-in
	Radar Target facilities	
	Acquisition:	Manual or automatic up to 40 targets, up to 24 NM
	Tracking:	Automatic up to 40 targets, up to 24 NM
	Auto acquisition/Guard Zones	One auto acquisition zone stabilized on Ownship heading and size/shape configurable. Four sectors with fixed width of 0.5 NM configurable as auto acquisition or guard zone.
	AIS facilities	
	Presentation:	Up to 200 AIS targets in sleeping accepted with selectable priority (nearest range, most dangerous). Presentation filters according to AIS class, range, CPA, TCPA, speed.

3	TECHNICAL SPECIFICATIONS	
	Acquisition:	Manual or automatic activation of up to 100 targets plus manual selection through a table ordered in ship name and distance.
	Safe Checking	All 200 AIS targets in sleeping or activated state.
	Auto acquisition/ Guard Zones	Same zones described in Radar Target facilities
	Trial manoeuvres:	
	Trial course	For ARPA and AIS targets. Manually adjustable from 0° to 360° or automatically computed within 135° with reference to the present course
	Trial course	
	Trial speed	Adjustable from 0° to 50 Knots
	Trial ROT	Adjustable from 1° to 60°/min.
	Trial time	Adjustable with 1 minute increments
	Mapping:	Operator compiled maps up to 120 segments plus symbols and text strings with selectable colors and line styles.
	Map Stabilization	Relative, True (Dead Reckoning) or geographic.
	Map storage	By Name, on a built-in non volatile memory. Transferable via USB Memory stick
	Map adjustment	Position and Orientation
	Graphic functions:	True or relative time adjustable vectors
		Target identification number, trackball marker and true marks. AIS identification number, ship names or call signs.
		Time adjustable past position plots
		Four independent parallel index lines
		Waypoints and Route from EPFS.
		Own ship shape and activated AIS target shape on lower range scales.

Additional Features	
Zoom	Enlarges a selected area over the main PPI
Picture in Picture (CCTV)	Opens a window inside which is an area of the ship for monitoring; for example, the hold or car deck of a ship.
Simplified Conning information	Graphic display of sensors, e.g.: • Wind sensor • Steering Gear • Heading sensor • CCTV Input • Echo sounder • SDME sensor
Additional PPI	Additional PPI with the same functions as the main PPI, including the possibility to interact with different TXRXs at the same time
ECDIS interface	Function for complete integration with an ECDIS system connected via LAN
Video Combination	Possibility to select two radar sources and the possibility to view the two sources at the same time in a single image. The automatic Tracking uses the two sources to track targets, even across the blind sectors of the RADAR antennas

	Data readout:	
	ARPA Target data	Range/bearing, speed/course, CPA/TCPA and Latitude/Longitude.
	AIS Target data	Ship Name, MMSI, Call Sign, Range/bearing, speed/course, CPA/TCPA and Latitude/Longitude, Type, Status, Destination, ETA, ship size, AIS class.
	Ownship data	Heading, Speed/Course water or ground stabilized Geographic position and UTC time.
	System setting:	Safe Minimum CPA & TCPA, vector/past positions / trial / trails time
	Alarms:	Acoustic and visual warning for: Dangerous Target, Target in Guard Zone, Lost Target, System Failure and external interface sensors (EPFS and AIS).
	Other features:	Anchor-watch, echo reference speed (not for AIS enabled systems), EPFS speed.
		Built-in, electronic dual interswitch facility plus additional expansion up to four transceivers. Coaxial cable only connection (SXI mode) to TXRX.
	Inputs:	
	Gyro Heading	Analog - synchro or stepper Digital Fast NMEA (IEC 61162-2)
	Speed Log	Analog: PIT or two axis log Digital: NMEA (IEC 61162-1)
	EPFS	Serial Interface NMEA (IEC 61162-1)
	AIS	Serial Interface NMEA (IEC 61162-1)
	External Alarm Interface	Serial Interface NMEA (IEC 61162-1) – RAACK sentence
	Outputs:	
		Serial Interface NMEA 0183 (IEC 61162-1) RATTM - RAOSD – RARSD – RAALR – RATLB – RATTD sentences
		Dead Man Alarm, Power Fail, Danger Target relay outputs configurable as NC or NO
	Other Interfaces:	Double Ethernet port 10/100 with a full set of TCP/IP protocols. System redundancy for LAN connection failure. Four USB 2.0 port.

	ENVIRONMENTAL FEATURES	
	Operating temperature:	-15°C / 55°C (IEC 60945 protected equipment)
	Storage temperature:	-25°C / 70°C (IEC 60945 protected equipment)
	Relative humidity:	Up to 93% at 40° (IEC 60945 protected equipment)
	Water proofness	Drip proof
	Vibrations	as per IEC60945
	Power consumption:	500 W max (depending from monitor and wind load on TXRX)
	Power Supply:	220/115 VAC 50/60 Hz
	Dimensions (mm):	Core Unit Only
	width	460
	height	350
	depth	150
	Weight (Kg)	
	Keyboard	2.0
	Core Unit	9.0
3	TYPE APPROVAL	
		IEC 60945 (General Requirements)
		IEC 62388 (Radar Performance)
		IEC 61162-1/2 (NMEA interface)

WARNING

A high mast position is good for long range detection but it affects heavily the detection in sea clutter. For optimal detection in sea clutter, suggested antenna height from sea level is around 20 m.

Usually the contradictory specifications are solved with installation of more than one antenna, for example one at 30 m for long range detection and one at 20 m for optimal detection of low intensity echoes in sea clutter.

Longer antennas for X-Band are less susceptible to rain and sea clutter.

1.5 OTHER FEATURES

- CPA alarm limit range from 0.1 to 9.9 NM
- TCPA alarm time limit from 1 to 60 min
- Auto Diagnosis: On-line diagnostics
- Antenna rotation data: Encoder or Proximity Switches.

1.5.1 Standard AC Power Supply Line

- Voltage: 220 or 115 Vac +/-15% 50/60 Hz single phase
- Power Consumption: Max 120 W (Monitor, Core unit and Keyboard).
- Check the Transceiver Manual in case the Transceiver is directly supplied by the Core unit.

1.5.2 Mechanical Characteristics

- Refer to Figures in Chapter 9.

1.6 SYSTEM CONFIGURATION

1.6.1 General

The ARGUS radar has been designed to be interfaced with up to two, or four (optional), transceivers.

The system configurations can be:

- Single Transmitter/Single Display (1a) for the connection between a display and an ARGUS X-Band Transceiver.
- Single Transmitter/Multi Display (1b) for the connection among several displays and an ARGUS X-Band Transceiver.
- Dual Transmitter/Single Display (2a) for the connection between a display and two ARGUS X-Band Transceivers.
- Dual Transmitter/Multiple Display (2b) for the connection between several displays and two ARGUS X-Band Transceivers.

1.6.2 Supported Transceivers General Specifications

TXRX/Pedestal Unit Type	Band	Output Power	Type	HSC	Category	Rotation speed	Category of ship/craft
Argus 12U	X-Band	12 kW	Up Mast	No	Exposed	22 rpm	CAT1/CAT2
Argus 25U	X-Band	25 kW	Up Mast	No	Exposed	22 rpm	CAT1/CAT2
Argus 12U	X-Band	12 kW	Up Mast	Yes	Exposed	44 rpm	CAT1H/CAT2H
Argus 25U	X-Band	25 kW	Up Mast	Yes	Exposed	44 rpm	CAT1H/CAT2H

1.6.3 Antenna types Technical Specifications

	X-Band		
Unit Type	6 Ft. X P Antenna	9 Ft. X P Antenna	12 Ft. X P Antenna
Length (Swing Circle)	6' / 1800 mm	9' / 2650 mm	12' / 3618 mm
Horizontal Beamwidth	1,35°	0,9°	0,7°
Vertical Beamwidth	22°	22°	22°
Polarization	Horizontal	Horizontal	Horizontal
Sidelobe within +-10°	-27 dB	-26 dB	-26 dB
Sidelobe outside +-10°	< -30 dB	< -30 dB	< -30 dB
Category	Exposed		

1.6.4 System Interfacing Definition

During the setting-up phase or after a system check-up it is possible to define all the values and their characteristics. The values to be defined and/or changed are:

- Azimuth
- Heading Line
- Skew Azimuth
- Trigger Delay
- Video Signal
- Trigger
- Antenna type
- Transceiver I/O connection

1.6.5 System Redundancy

The ARGUS system has full interswitch capability integrated in the CORE unit. This feature is made to implement system redundancy on a standard installation composed by two transceivers and two consoles.

A console will always be able to control one of the two transceivers connected, also if the other console is out of order or switched off.

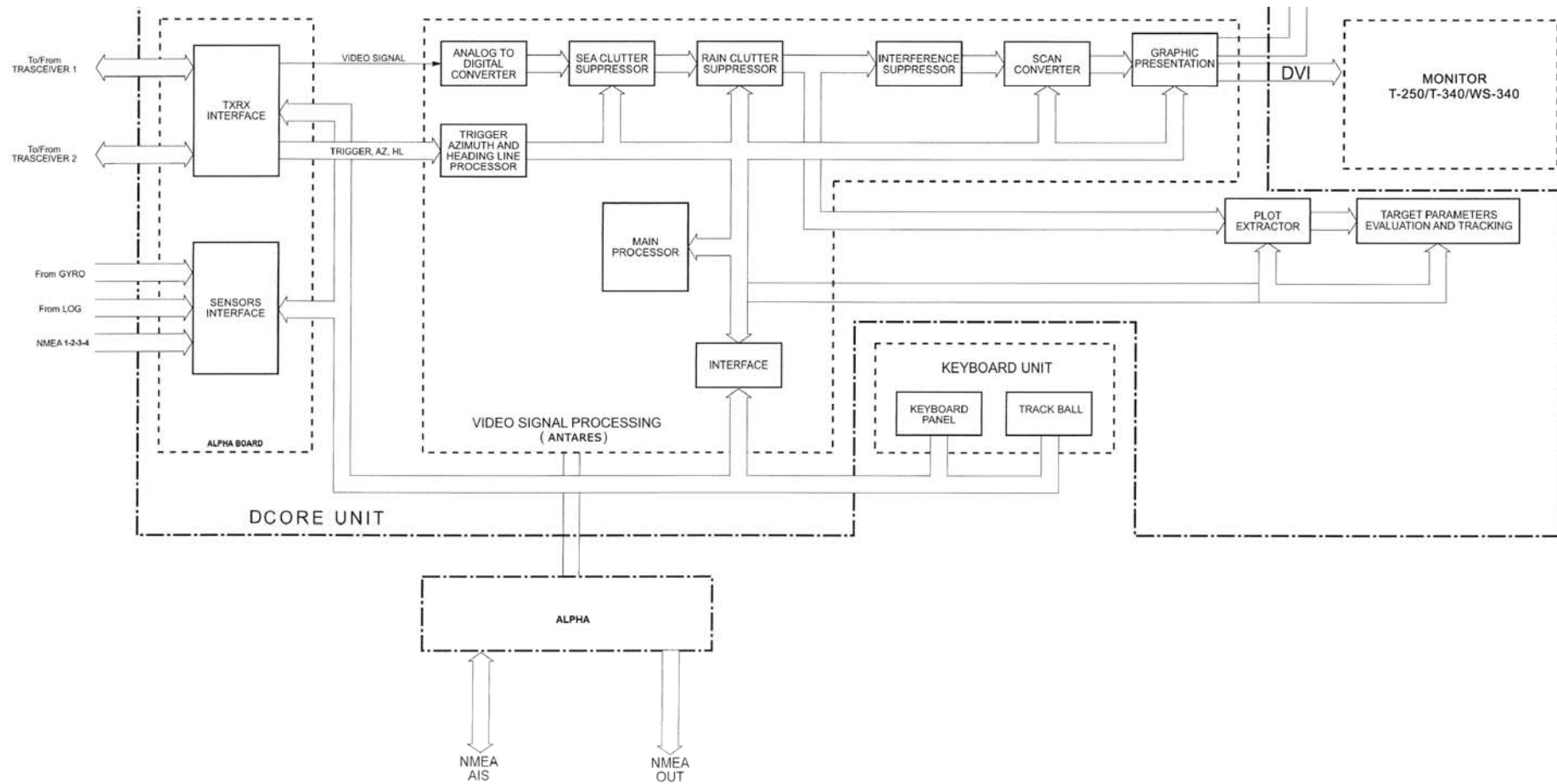
If one of the Transceivers is failing, then both radar consoles can display the received radar signal, but only the console with the highest master priority can control it (See Interswitch function).

A radar console in slave mode cannot control the transceiver, so it shall use the same radar pulse, PRF and receiver tuning setting of the master console.

ARGUS RADAR

General Information and Safety Precautions

Figure 1.6.1 ARGUS RADAR Functional Block Diagram



CHAPTER 2

GENERAL OPERATION

2.1 INTRODUCTION

The following Chapter describes the operating instructions, the information and the procedures to be performed in order to properly use the ARGUS Radar Console.

The Chapter is organised in the following Paragraphs:

- 2.2 Control panel (controls, indicators and their purposes) and switching on procedure description
- 2.3 Main Monitor presentations
- 2.4 Monitor presentation (wide screen)

2.2 CONTROL PANEL AND SWITCHING ON SYSTEM PROCEDURE

2.2.1 Control Panel Controls and Indicators

The System configuration is intended to be fitted with a control panel containing standard and expanded key functions:

2.2.1.1 The Control Panel's three operating push-buttons (Standard key functions)

Trackball	(pos. 1);
Switching on Push-buttons	(pos. 2, 3, 4);
Power On Button	(pos. 2);
TX On Button	(pos. 3);
Sys Fail Indicator (LED)	(pos. 4);
Operating Push-buttons	(pos. 5, 6, 7).

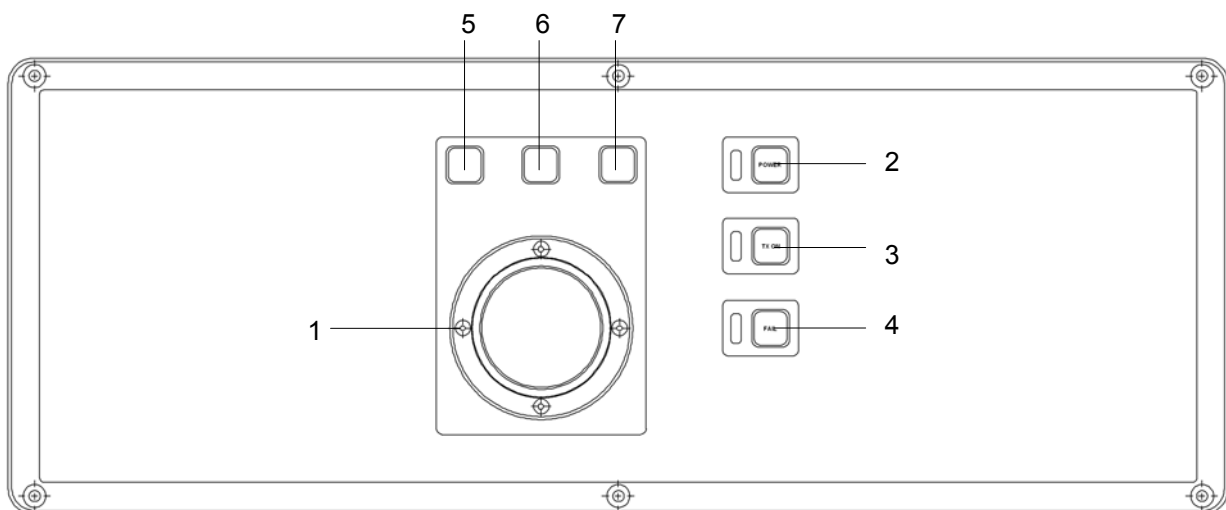


Figure 2.2.1 Standard key functions

Table 2.2.1 – Control Panel - Controls and Indicators Section

REF.	CONTROL OR INDICATOR	DESCRIPTION AND FUNCTION
1	TRACK BALL	Positioning input device. Use the trackball to move the cursor on the PPI (displayed as a cross) and on the SYSTEM DATA AREA (Menus area, displayed as a black arrow, except for the progress bars in which it is possible to change the value, where it's displayed as a double horizontal thin arrow).
2	POWER ON	This push-button with green LED indicator is used to switch between "Sleep" and "On" conditions. When the system is in Sleep condition it appears to be Off, but the electronic is still on, waiting for the real On condition request. In order to switch on the Monitor, and the Control Panel, the operator has to press the Power button, and holding it pressed for more than 5 seconds. An audible beep will sound and the green LED next to the push-button will change to high brilliance. In "On" condition, by pressing the Power button again, the Monitor, and the Control Panel will be switched off again and another beep will sound and the green LED will return to low brilliance, but the system is now actually in Sleep mode (<i>to shut down the system completely, the Main Power Switch of the Core Unit must be set to position 0</i>).
3	TX ON	This push-button is used to switch the system between STANDBY and TX ON. In STANDBY the display does not request the TXRX to transmit, but it is possible to get some information from the system, depending on the type of TXRX connected. In TX ON the RADAR (if Master) radiates and the antenna turns. This is the normal working condition (<i>the switching "STANDBY to TX ON" and "TX ON to STANDBY" are executed at the release of the push-button</i>).
4	FAIL	This indicator is normally Off. A red colored LED will be switched on when a System Failure occurs (<i>this is an indicator, not a button</i>).
5-6-7	TOP PUSH-BUTTONS	Operating push-buttons. When the push-button is pressed by the operator, the System will execute the suggestion displayed in the Help Line.

2.2.1.2 Expanded key functions

On the Control Panel the controls and the indicators are positioned in the following sections (Figure 2.2.2), (the table number indicates where the controls and the indicators are described).

The expanded key functions are composed of the following sections:

User Functions Section	(pos 1)	Table 2.2.2
Radar Target Section	(pos 2)	Table 2.2.3
Symbols Section	(pos 3)	Table 2.2.4
Video Processing Section	(pos 4)	Table 2.2.5
PPI Section	(pos 5)	Table 2.2.6
System Section	(pos 8)	Table 2.2.7
Display Section	(pos 6)	Table 2.2.8
Range Section	(pos 7)	Table 2.2.9

Moreover, Figure 2.2.2 describes the controls of the Monitor Control Panel.

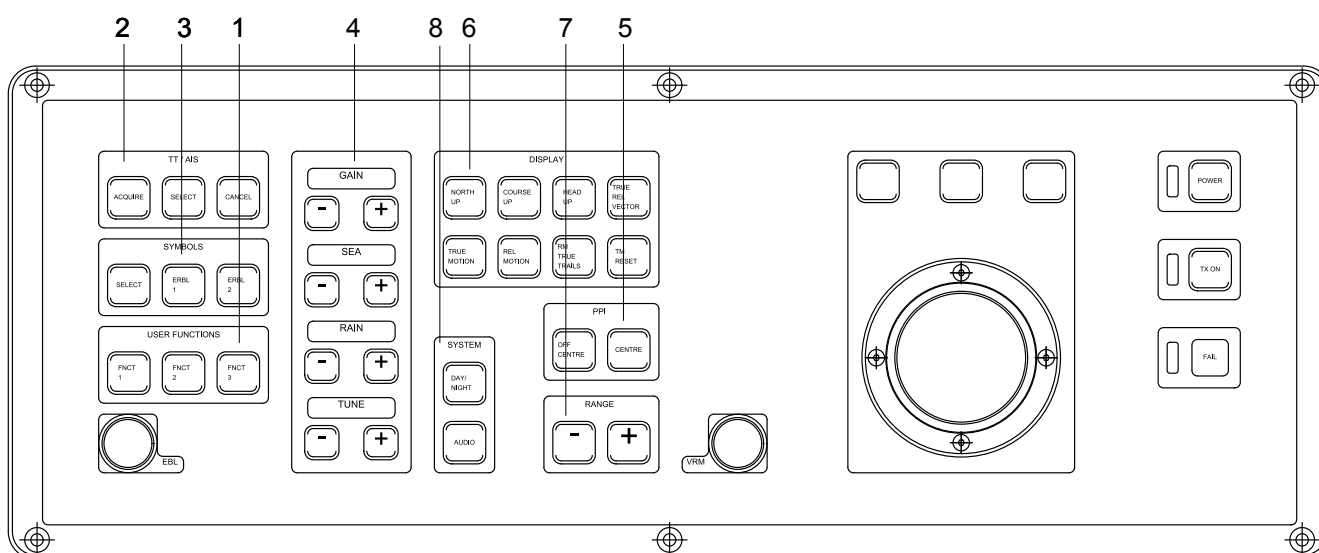


Figure 2.2.2 Expanded key functions

Table 2.2.2 - User Function Section

REF.	CONTROL OR INDICATOR	DESCRIPTION	FUNCTION
1	USER FUNCTIONS	Momentary push-button	Used to execute one of the three programmable functions as described in Para 2.5.1.11

Table 2.2.3 - Keyboard Unit - Target Section

REF.	CONTROL OR INDICATOR	DESCRIPTION	FUNCTION
1	ACQUIRE	Momentary push-button	Used to acquire a Radar target or to activate an AIS target.
2	SELECT	Momentary push-button	Used to display alphanumeric information related to the selected Radar Target or AIS.
3	CANCEL	Momentary push-button	Used to delete a Tracked Radar target or to deactivate an AIS target.

Table 2.2.4 - Keyboard Unit – Symbols Section

REF.	CONTROL OR INDICATOR	DESCRIPTION	FUNCTION
1	SELECT	Momentary push-button	Used to select alternatively the EBL 1 or 2.
2	EBL/VRM 1-2	Momentary push-button	Used to enable or disable the Electronic Bearing Line and the Variable Ring Mark. When the push-button (1 or 2) is pressed, the ERBL 1 or 2 is automatically visualised, and the data are displayed in the related windows. Refer to Para 4.1.3 for further details.

Table 2.2.5 - Keyboard Unit – video processing Section

REF.	CONTROL OR INDICATOR	DESCRIPTION	FUNCTION
1	TUNE	Increment / decrement push-buttons	Used to adjust the tuning of the equipment. The Tuning may be checked by means of the numeric indicator on the screen, or directly by observing a target echo. In the last case, the echo level should be slightly above the noise level (not saturated). The Tuning meter indication is displayed on long pulse only. For more details, refer to Para 3.2.8.7
2	GAIN	Bar Increment / decrement push-buttons	Used to adjust the video level presentation. The optimum setting is when the receiver background noise is hardly visible. For more details, refer to Para 3.3.1
3	RAIN	Bar Increment / decrement push-buttons	Used to reduce the Rain Clutter. Large target masses will show only the immediate shoreline, thus, permitting prominent targets on land to appear. Rain or snow clutter can be reduced by the use of the potentiometer, and covered target revealed. For more details, refer to Para 3.3.3
4	SEA	Bar Increment / decrement push-buttons	Used to reduce the Sea Clutter by reducing the gain at minimum range gradually returning to normal. The gain varies with the distance according to a predetermined curve and in an amount proportional to the setting. When the potentiometer is turned fully counter clockwise, the gain is uniform over the entire screen.

Table 2.2.6 - Keyboard Unit - PPI Section

REF.	CONTROL OR INDICATOR	DESCRIPTION	FUNCTION
1	PPI OFF CENTRE	Momentary push-button	Used to select the off-centered presentation. For more details, refer to Para 3.2.8.3.
2	PPI CENTRE	Momentary push-button	Used to select the centered presentation. Not active in True motion presentation.

Table 2.2.7 - Keyboard Unit - System Section

REF.	CONTROL OR INDICATOR	DESCRIPTION	FUNCTION
1	DAY/NIGHT	Momentary push-button	Used to select the background color. For more details, refer to Para 2.5.8.3.
2	AUDIO	Momentary push-button	Used to enable or disable the keyboard audio. For more details, refer to Para 7.2.1

Table 2.2.8 - Keyboard Unit - DISPLAY Section
Controls and Indicators

REF.	CONTROL OR INDICATOR	DESCRIPTION	FUNCTION
1	NORTH UP	Momentary push-button	Used to select North up presentation (referred to Gyro North). When the PPI is in True Motion mode the presentation is automatically selected. For more details, refer to Para 3.2.3.
2	COURSE UP	Momentary push-button	Used to select a stabilised Course-Up presentation. It is alternative to the above push-button. Press again in Course-Up mode to enter a new course reference.
3	HEAD UP	Momentary push-button	Used to select Head-up presentation (referred to Heading Line). It is alternative to the presentation explained at points 1 and 2.
4	TM RESET	Momentary push-button	Used to perform a manual reset of True Motion. When activated, own ship's position is set to 60% off-center with its calculated speed vector pointing through the centre of PPI. Automatic reset happens if own position exceeds 60%.
5	TRUE MOTION	Momentary push-button	Used to select True Motion mode presentation.
6	RELATIVE MOTION	Momentary push-button	Used to select Relative Motion mode presentation. It is alternative to the above push-button.
7	TRUE REL VECT	Momentary push-button	Used to select the presentation of true or relative vectors. If relative vectors are selected while TRUE MOTION is active, the relevant message on the screen is in reverse video. The same occurs when true vectors are selected and a RELATIVE MOTION is active.
8	RM TRUE TRAILS	Momentary push-button	Used to enable True Trails presentation in Relative Mode. When the push-button is pressed, the push-buttons at points 7 and 8 are overridden.

Table 2.2.9 Keyboard Unit - Range Section

REF.	CONTROL OR INDICATOR	DESCRIPTION	FUNCTION
1	RANGE	Two momentary push-buttons	Used to select one of the nine different range scales, expressed in NM, and the relevant range rings for PPI presentation. With the + push-button it is possible to increase the range scale while with the - push-button it is possible to decrease it. For more details, refer to Para 3.2.8.1.

2.2.2 Procedure To Switch On The System

Switching on the Main Power Switch placed on the Core unit, the system will boot and the “Standby” window will appear. Pushing the POWER ON button (Figure 2.2.1 pos. 2) the System will switch between “Standby” and “Sleep” mode. When the system is in Sleep mode it appears to be powered off, but the electronics are still on, waiting for the actual Power On mode request. In order to switch on the Monitor and the Keyboard, the operator has to press the POWER ON button, and holding it for more than 3 seconds. An audible beep will sound and the green LED next to the push-button will change to high brilliance.

In Power On mode, by pressing this push-button again (for more than 3 seconds), the Monitor and the Keyboard are switched off again, another beep will sound and the green LED will change back to low brilliance; the system is now in Sleep mode (*to shut down the system completely you need to switch off the Main Power Switch of the Core Unit, Figure 8.6.5, position 3*).

After switching on the system, the Standby Window will be shown on the Monitor and the Brilliance is automatically set to the lowest level in Night colors. This feature is important in case of switching on during the night to avoid a strong flash into the eyes of the operator. For daylight operation click on the centre mouse key or press the Day/Night Button to obtain the Day Highlighted colors palette. As shown in figure 2.2.3 the Standby Window provides informative data, such as:

- TXRX Status (Standby, Short, Medium or Long Pulse, warm-up countdown, etc.)
- possible selection of Transceivers (with only one connected, no selection is possible)
- operation mode at the next Tx On (master or slave)
- Magnetron and System Life Times (available only for TXRX version 54 or higher)

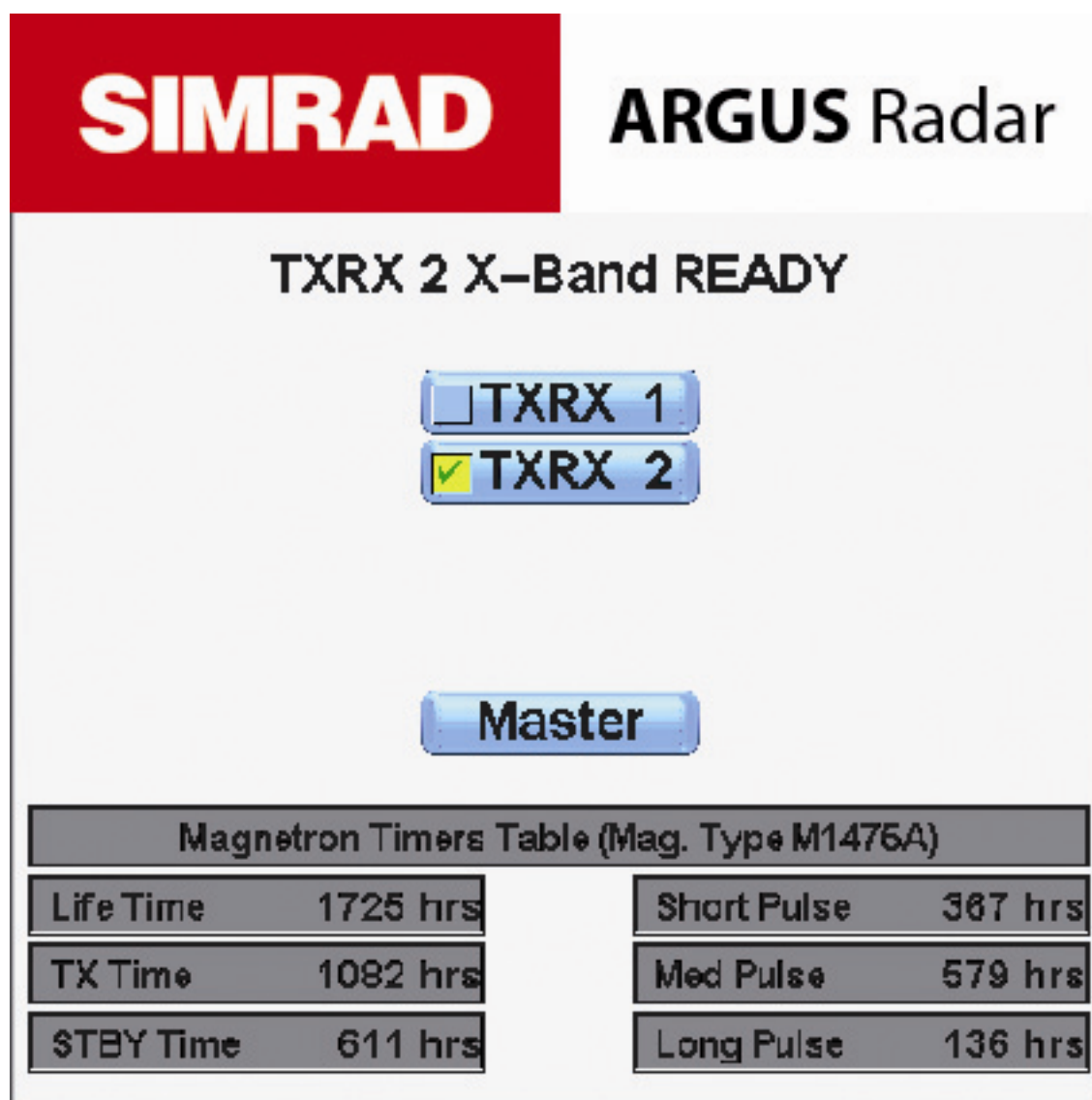


Figure 2.2.3 TXRX Standby Window Information

When the System is in Standby (Standby window visible in the centre of the screen and Tx On yellow LED off) the operator is allowed to Switch on the RF transmission, using the TX ON button. In Standby the RADAR display doesn't require the TXRX to transmit, but the transmission could be on due to the control by another display or the TXRX could also be in LOCAL MODE in transmission (for more details regarding the LOCAL / REMOTE mode refer to the transceiver technical manual). In TX ON mode, the RADAR antenna (if Master) radiates and turns. This is the normal working condition ***(the STANDBY to TX ON and TX ON to STANDBY switching are executed at the release of the push-button).***

In TX ON condition, pressing the TX ON button the system will return to Standby.

2.3 MONITOR PRESENTATION (4:3 SYSTEM)

The Monitor function is to visualise all necessary information to carry out the scheduled navigation and show information related to targets, own ship, settings and measurements, etc...

According to the procedure described in Para 2.2.2, clicking the TX On button will turn on the yellow LED and set the scanner in transmit mode. When transmitting, the following window will be displayed on the screen.

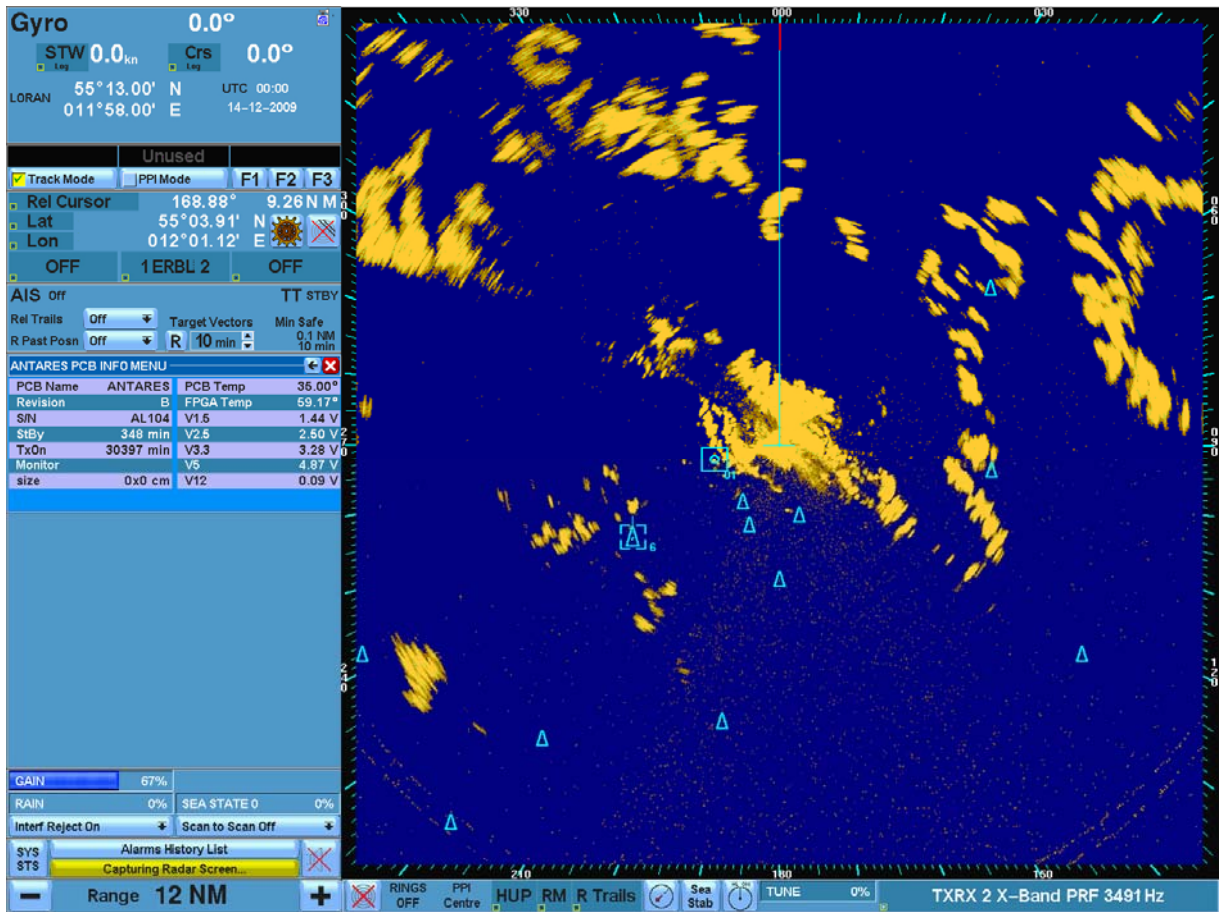


Figure 2.3.1 Monitor Display - General view

The window displayed can be divided into the following two main areas:

PPI Area in which the Radar video is displayed. In this area all the tracking and navigation operations can be performed.

SYSTEM DATA Area, which features all the menus for the operator to control the System, to set all the data required by the System and to perform all the RADAR Target /AIS operations. The SYSTEM Data Area is organised in the following 10 sections:

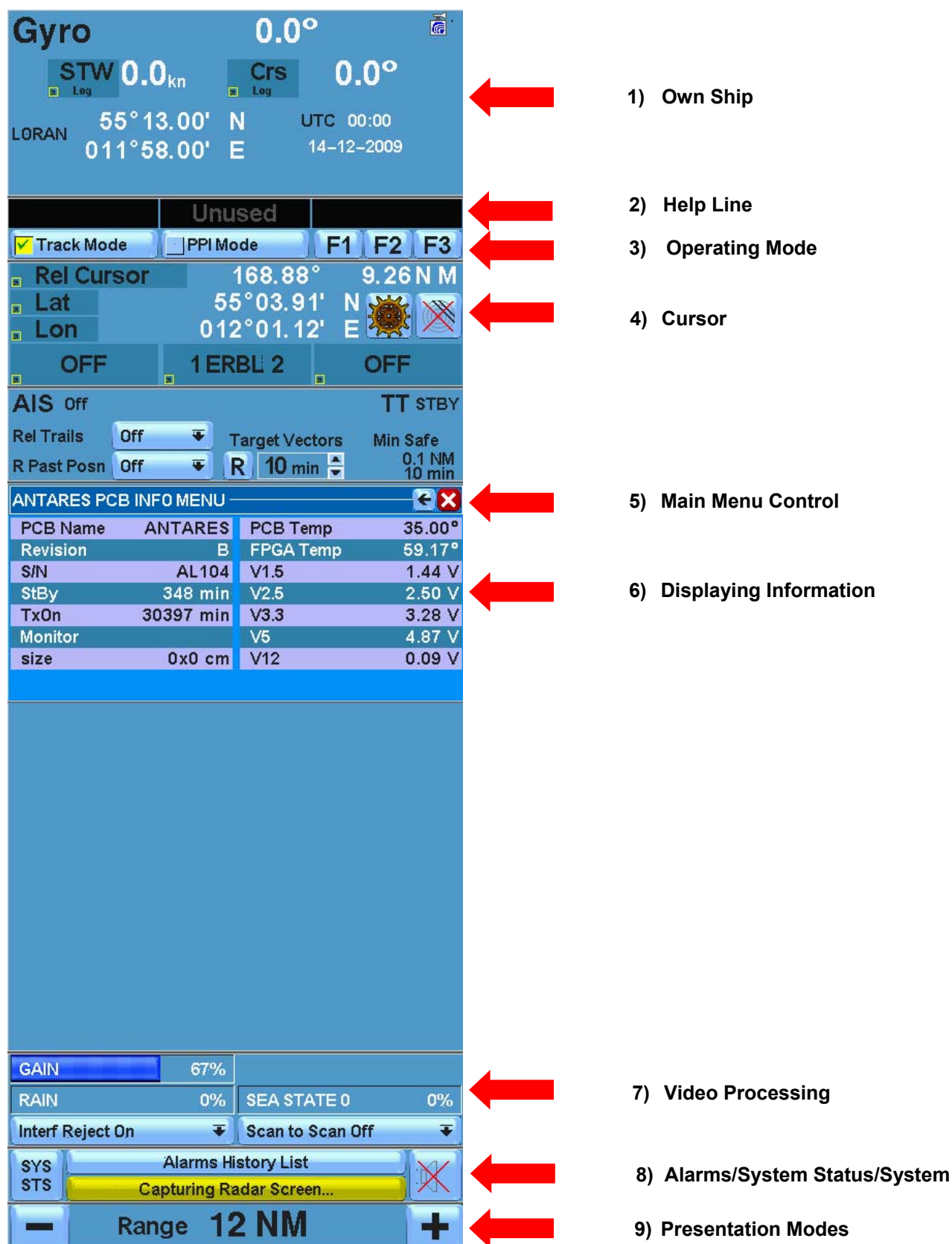


Figure 2.3.2 System Data Area Sections

Table 2.3.1 System Data Area

REF.	SECTIONS	FUNCTION
1	OWN SHIP	In this section all Parameters regarding own ship are indicated: - AIS Operating Mode (ON/OFF, if connected) - Heading - Speed and Course - Own ship geographic position - UTC or Local Time - Map name (if displayed) - Number of Tracked Targets or AIS with target overflow identification - AIS Input Priority, Display Filtering, Source data during Target association
2	HELP LINE	This line with three columns indicate the various options for each mouse button according to the operating mode (Tracked Target, PPI, Map Editing).
3	OPERATING MODE	Selecting one of the two modes, the operator can select operating in Tracked Target or PPI mode. Changing the operating mode, will consequently change the System suggestions.
4	CURSOR	In this section all the Parameters regarding the cursor are displayed i.e. Cross Cursor in: - Relative/True - Geographic Position
5	MAIN MENU CONTROL	By pressing the Main Menu, a drop down menu with seventeen submenus, will be displayed. Refer to Para. 2.5.7 for the explanation of these submenus.
6	DISPLAYING INFORMATION	In this section (normally empty), the information, data and measurements according to the operator actions e.g. the Menu and the Target Data are displayed.
7	VIDEO PROCESSING	This section includes the signal processing menu. The signal processing menu includes: GAIN, TUNE, RAIN, SEA, Scan to Scan Correlation, Sweep to Sweep Correlation, Trails On/Off and Past Position On/Off.
8	ALARMS/SYSTEM STATUS/FAILURE	This section provides the Alarms List (red color), the System Status (standard background color) and the Failures (yellow color).

REF.	SECTIONS	FUNCTION
9	PRESENTATION MODES	This section of the System Data Area Monitor includes the buttons and shortcuts for: - Visualisation: In the Orientation and Presentation Modes Section, the operator can select the visualisation mode of the monitor display - TX/RX Control Status: Master/Slave, Power, PRF - System Status: it is displayed the status of the following unit: Trigger, Antenna, Heading Line, Gyro, Log, Radar External Interface (REI), Keyboard, TX/RX, Auto Tracking Aid (ATA), Video Process - Presentation Reset : The function of this button is to reset Own Ship position in the PPI (True or Relative) - Range Scale: selected Rings On, the operator, by means of the two buttons + and – will increase or decrease the range scale

WARNING

The true data (bearing, data, vector, etc) are always related to north and relative to heading.

2.4 MONITOR PRESENTATION (WIDE SCREEN)

This type of configuration has the same basic characteristics as the 4:3 monitor, but with the availability of a larger area in which to view the different sensors.

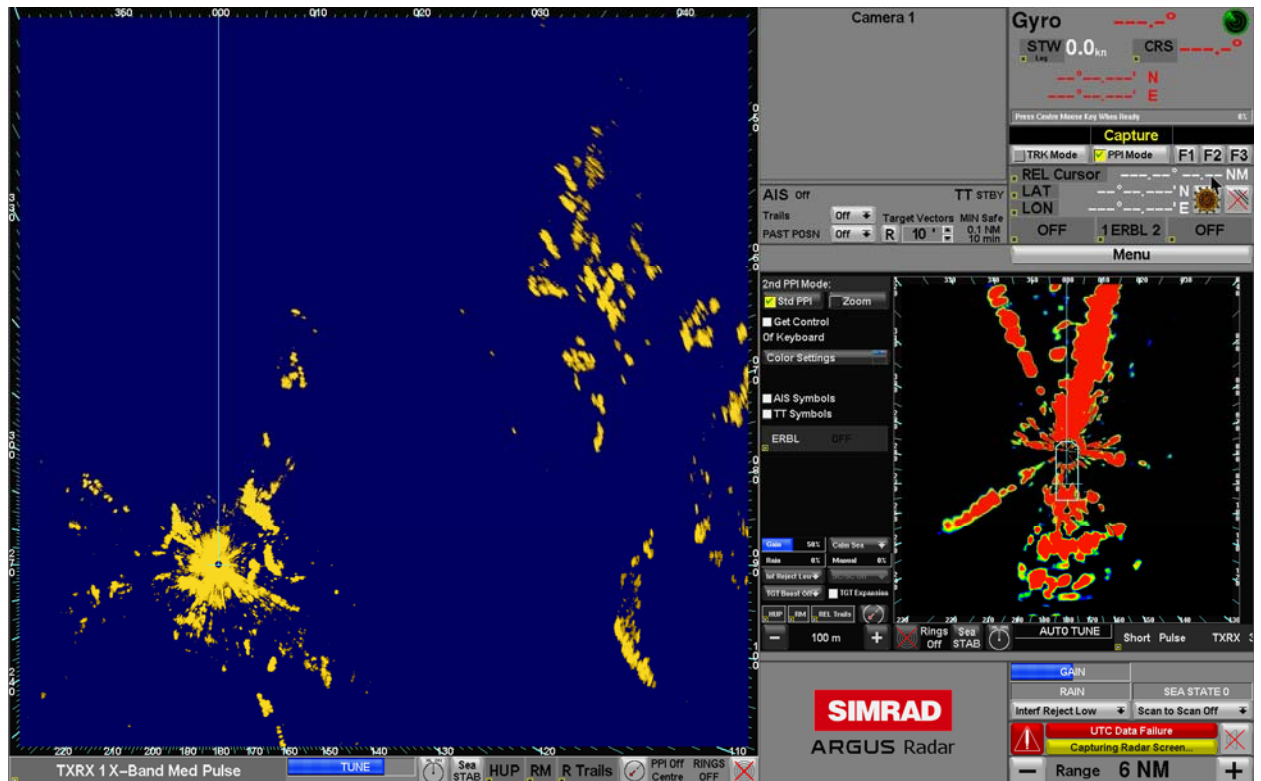


Figure 2.4.1 Monitor Display – Wide screen

The window displayed can be divided into the following two main areas:

PPI Area in which the video Radar is displayed. In this area, upon command of the operator, all the tracking and navigation operations can be performed.

SYSTEM DATA Area, the same functions as the 4:3 System monitor, but with a larger area for extended functions, like graphics sensor presentation.

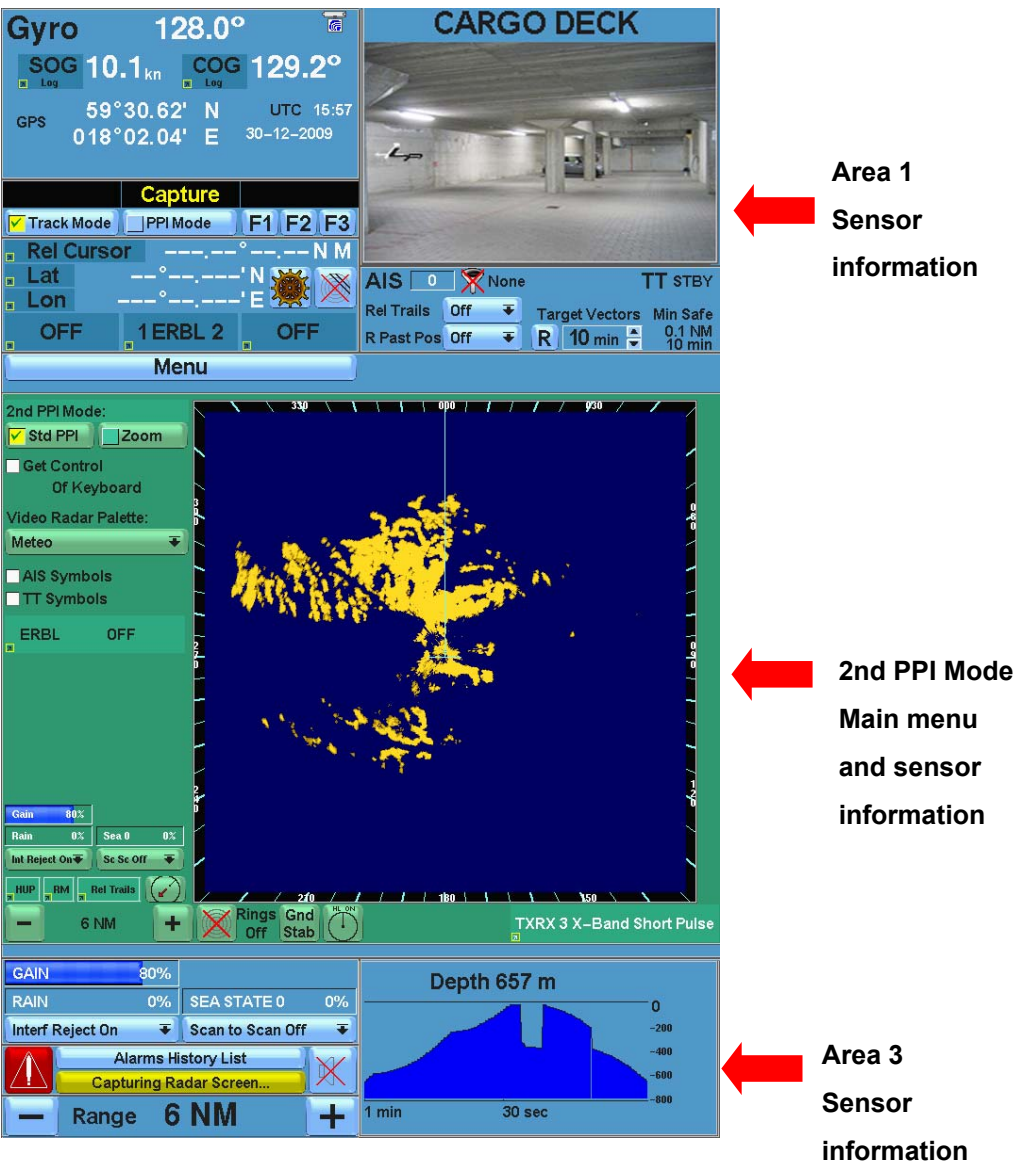


Figure 2.4.2 System Data Area Sections

Table 2.4.1 System Data Area

SECTIONS	FUNCTION
Area 1 Sensor information	In this area, it is possible to view up to two sensors
2nd PPI Mode Main menu and sensor area information	In this area, it is possible to view up to four sensors or it can be used exclusively to view the second PPI
Area 3 Sensor information	In this area, it is possible to view up to two sensors

2.5 GENERAL OPERATING PROCEDURES

In order to properly operate the Argus Radar, it is necessary to know some basic information regarding the GUI (Graphic User Interface), the menu structure, how to reach each function and what information is available in the Argus Radar Display.

In the following paragraph, a general description of the GUI is provided. Paragraph 2.5.2 describes each section of the System Data Area.

2.5.1 General

2.5.1.1 GUI Widgets Description

The GUI of the Argus Radar Display is composed by objects called widgets, described in the following sub-paragraphs.

2.5.1.2 Buttons

Pressing the Buttons, will consequently perform an action. The Buttons can be sub-divided into 3 button types:

- Menu Buttons, which open a window with another menu. They have a square symbol on the right, similar to a small menu window and they don't change their caption.
- Bi-stable Buttons, which just change a parameter (i.e. ON/OFF) and consequently change their caption.
- Mono-stable Buttons, which perform an action, not changing their caption (i.e. range +).
- List Buttons, which open a List Box or a Combo Box under them. They have a down-oriented arrow symbol on the right and they change their caption according to the section of the list.

Bi-stable Button (Off and On)



Menu Button



List Button



The different type of Buttons look very similar and when pressing them, the operator can see that the button has been pressed.



Button style when pressed



Button style when focusing (cursor pointing)

Almost all of the buttons activate their action when they are released after being pressing, so the operator has the possibility to move the mouse pointer away and not execute their action even if he already pressed them. The Buttons have a focusing function (for more details regarding the focusing refer to Para 2.5.1.12).

2.5.1.3 Labels

Normally the Labels are just indications, placed where important context information is described, but some of them are editable, and the operator can change their caption or the value indicated in them. The editable Labels can easily be distinguished as they have a frame and the focusing function (for more details regarding the focusing refer to Para 2.5.1.11).

The “Normal” Labels are just indications; they don’t have any frame or focusing function. The data that they contain can be in two different colors depending on the selected palette and if the data is static or dynamic. For example: with the day blue palette, around the top side of the System Data area, “Gyro” is written with a dark color, as it’s static (it’s always “Gyro”). Next to it there is the gyro value, which is in a bright color, as it is dynamic.

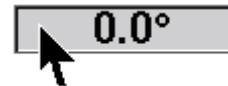
When the numerical field shows a ----.— the data is invalid or missing.



Normal Labels (Static and Dynamic)



Editable Label (with frame)



Focusing on Editable Label

2.5.1.4 Shortcuts

The shortcuts are essentially a shorter way to modify the status of various Radar aspects, for example switching On/Off the ERBL or changing the Orientation Mode without having to enter the Main Menu and thereafter the respective menu. Passing over the shortcuts with the mouse pointer, the possible options will appear in the Help Line.



Figure 2.5.1.4 Shortcuts

2.5.1.5 Spin Buttons

The Spin Buttons are similar to labels, but with some important differences. It is possible to change the displayed value passing with the mouse pointer over the two horizontal or vertical arrows.



Figure 2.5.1.5 Spin Buttons

It is also possible to modify the value passing with the mouse pointer over the value itself. The possible choices will appear in the Help Line, in this case:

Decrease Enter Value Increase

2.5.1.6 Switch Buttons

These widgets look very similar to the previously described buttons, but their behaviour is very different:

Normally they form a group in which only one is selected. All the others are automatically de-selected. The green “√” inside a yellow square indicates the selected Switch Button.



Switch Button no. 1 selected, going to select no. 2

Switch Button no. 2 just selected

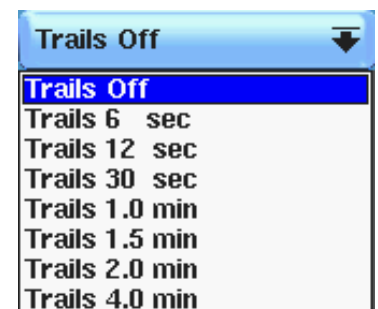
Figure 2.5.1.6 Switch Buttons

The Switch Buttons have the focusing function (for more details regarding the focusing, refer to Para 2.5.1.11).

2.5.1.7 List Boxes

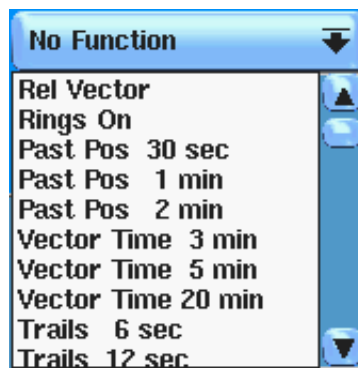
The List Boxes are lists of items which are displayed when pressing the buttons with the down-oriented arrow on the right (List Buttons, see Para 2.5.1.2). Having selected an item, the list is automatically closed and the caption of the button memorizes the selected item.

When the list is open, clicking outside the List Box or on the button, the list will automatically close with no effect.



2.5.1.8 Combo Boxes

The Combo Boxes look very similar to the List Boxes. They are lists of items displayed pressing the button with the same kind of symbol, but they can contain a lot of items and the quantity of them can not be fixed. On the right side of the lists they have a column with an upper-oriented arrow at the top, a down-oriented arrow at the bottom and a slide bar in the middle, so the operator can scroll the list up and down to visualize all the items.

2.5.1.9 Check Buttons

The Check Buttons are just a Label which meaning can be activated or deactivated according to the "✓" in the white square on the left.



The function indicated in the Label is deactivated if the white square does not have a "✓".

2.5.1.10 Progress Bars

The Progress Bars are rectangles in which an indication of a value is graphically drawn with a blue bar increasing from left to right. In some cases they can accept input by the operator (i.e. the Video Processing); otherwise they just indicate the progress status of the value. They can be by their cursor shapes, a left-right oriented arrow for those, which accept input and a normal up-oriented arrow for the other ones. The focusing on the Progress Bars is shown drawing a frame inside them.

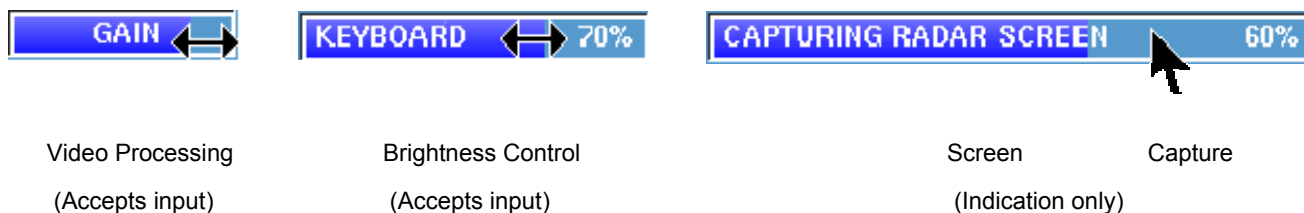


Figure 2.5.1.10 Check Buttons

2.5.1.11 Functions of the Trackball's Three Buttons

From this point ahead the 3 buttons of the trackball will be called Soft Keys (SK).

Following a short description of the Soft Keys meaning, when no other suggestion is provided by the Help Line:

- The left button of the trackball, is as in most systems with a GUI, is normally used to press Buttons, to check the Check Buttons or to select a Switch Button.
- The centre button has normally the same meaning as the left one.
- The right button is normally used to close a menu if there are any open, otherwise it doesn't have any function.

If the Help Line labels are not empty, the SKs take the function shortly described in the relevant label of the Help Line.

For example: when in the left label of the Help Line is written "**Tgt Acquire**" the left SK takes the target acquiring function and once clicked, the echo under the trackball pointer will be acquired.

Other example: when the trackball pointer is placed on an editable label, the 3 labels of the Help Line normally indicate "**Decrease**", "**Enter Value**", and "**Increase**". This means that the left SK decreases the value inside the label when pressed, the right SK increases it and the centre SK opens another window with a numeric keypad to enter a new value from scratch. This system allows the operator to carry out all the functions of the Argus Radar Display only with the three SKs. In the following page some examples of the functions of the SKs and the relevant functions of the Help Line are described.

			LEFT SK	CENTRE SK	RIGHT SK
Tgt Acquire	Tgt Select	Tgt Cancel	Acquire Tracked targets or Activates AIS ones	Select Tracked Target or AIS targets to display numeric data	Cancel Tracked Target or AIS targets
Offcentre	Select	PPICentre	The PPI will be centered at the position of the Mouse Pointer when pressed	Select ERL and Parallel Indexes, keeping it pressed, the objects can be moved	The PPI will be centered again on its geometrical centre
		Close Menu	Normal Mouse Click (press buttons)	Normal Mouse Click (press buttons)	Close the Menu open in that moment
Decrease	EnterVlue	Increase	Decrease the relevant value one step for each press	Open the Numeric Keypad in order to enter a new value	Increase the relevant value one step for each press

			LEFT SK	CENTRE SK	RIGHT SK
Decrease	Auto	Increase	Decrease the relevant value of the relevant video processing, keeping it pressed the vaule decrease quickly	Set the relevant video processing in Automatic mode (where possible)	Increase the relevant value of the relevant video processing, keeping it pressed the vaule increase quickly
Unused	Manual	Unused	Button not used in this function	Set the relevant video processing back to Manual mode	Button not used in this function
Ins Line Ins Text	Hook Txt Modify Txt	Posit Adj Undo Adj	Place a Map line on PPI (only in Maps Editing)	Place a Map text on PPI (only in Maps Editing)	Place a Map symbol on PPI (only in Maps Editing)
InsSymbol	Cancel Txt	Angle Adj	The displayed Map will be hooked to be moved in the next step	Quit by the Map Position Adjust condition	The displayed Map will be hooked to be rotated in the next step
Apply Shift	Undo Adj	Unused	The displayed Map will be released (was hooked) in the position where it is when pressed	Quit by the Map Position Adjust condition and Map replaced back to the original position	Button not used in this function
Unused	Undo Adj	Apply Rot	Button not used in this function	Quit by the Map Position Adjust condition and Map replaced back to the original orientation	The displayed Map will be released (was hooked) and oriented as it is when pressed
Hook Line/TEXT	Modify Line	Canc Line	Hook the focused map line to be moved	Open a Menu to modify the focused map line	Cancel the focused map line
			Hook the focused map text to be moved	Open a Menu to modify the focused map text	Cancel the focused map text
Hook Symb	Modify Symb	CancelSymb	Hook the focused map symbol to be moved	Open a Menu to modify the focused map symbol	Cancel the focused map symbol
NUP	HUP	Res Course	Set orientation to North UP	Set orientation mode in heading up	Reset course up orientation to a new course
HUP	CUP		Set orientation mode in heading up	Set orientation mode in course up	
NUP	CUP		Set orientation to North UP	Set orientation mode in course up	

			LEFT SK	CENTRE SK	RIGHT SK
T Trails	/	R trails	Set Echo Trails True		Set Echo Trails True
T motion	/	R motion	Set Presentation mode to True Motion		Set Presentation mode to Relative Motion
Centre			PPI centre		
TXRX Menu			Open TXRX Menu		
Maps List	Show Map	Clear Map	Open maps list menu	Display select map	End Display and End selected map
Maps List	Hide Map	Clear Map	Open maps list menu	Hide display selected map	End Display and End selected map
Zoom Out	Anchor	Zoom in	Increase the enlargement ratio	Position in the centre of the zoom	Reduce the enlargement ratio
Off	Res Centre	Rel /True	Turn off ERBL	Reset ERBL to PPI centre	Set ERBL angle collocation to Relative or True
On /Off	Rel		On /Off Display ERBL On or Off Display ERBL	ERBL Relative	
On /Off	True		ERBL Orientation On or Off	ERBL True	
Geo Lock	O.S.Lock		ERBL Position is locked to Geographic position	ERBL Position is locked to own ship position	
Rel	/	True	Relative cursor position	True cursor position	
Decrease	Enter Value	Increase	Reduce the numerical value	Enter the numerical value	Increase the numerical value
Decrease	Unused	Increase	Reduce the numerical value	Button not used in this function	Increase the numerical value
EPFS	A Drift	Manual	Set EPFS speed as speed source	Set auto drift speed as speed source	Manual speed as speed source
LOG	A Drift	Manual	Set LOG speed as speed source	Set auto drift speed as speed source	Manual speed as speed source
LOG	EPFS	Manual	Set LOG speed as speed source	Set EPFS speed as speed source	Manual speed as speed source
LOG	EPFS	A Drift	Set LOG speed as speed source	Set EPFS speed as speed source	Set auto drift speed as speed source
Unused	Auto	Unused	Button not used in this function	Auto speed as speed source	Button not used in this function

			LEFT SK	CENTRE SK	RIGHT SK
Place Obj	Hook Obj	Select Obj	Place Object Object means: • Line • Symbol • Text	Hook Object	Select Object
Place Line	Unused	Close	Place line	Button not used in this function	Quit function
Place Txt	Unused	Close	Place text	Button not used in this function	Quit function
Place Symb	Unused	Close	Place symbol	Button not used in this function	Quit function
More info	Close M.S.		Targets data more info	Close minimum safe windows	
Min Safe	2 Targets	4 Targets	Open minimum safe windows	Show two targets	Show four targets
More info	All Fails	Close Menu	Information of fails	Information of all fails	Close Fails menu
Lat/Lon	ETA/TTG	Close Menu	Presents the cursor's coordinates	ETA and TTG set by the cursor distance	Close menu
Time Setup	Close Menu		Setting where you can set the time	Close menu	
Ais Setting	Assoc Off		Open Training Menu	Switch off association with data from AIS or Target Tracking for target	
Filter Off	Filter On	Off	Disable filter for symbols presented	Enable filter for symbols presented	Bypass the function
TT Source	Ais Source	Close Menu	Indicate source of data in Target Tracking	Indicate source of data in AIS	Close menu

Figure 2.5.1.10 Help Line Suggestions, Examples

2.5.1.12 Focusing Function

When placing the trackball pointer on a Button of the System Data Area, the Button will be highlighted with a quite different color. This highlighting is called “*Focusing*”. Removing the trackball pointer from the Button, it will return to its original color. If the Button is disabled, also the focusing will be disabled.

The Focusing is not only in the Buttons, it's available in some other widgets in which is possible to perform an action. The widgets, in which it is not possible to perform any action, don't have the focusing. The aspect of the widget changes in some way, depending on the kind of widget:

- The color of the Buttons normally changes to a brighter one, in some palettes it changes to a

darker one.

- The color of the Switch Buttons behaves in exactly the same way as the Buttons.
- The color of the Editable Labels normally changes to a darker one, in some palettes it changes to a brighter one.
- Inside the Progress Bars is drawn a frame, which color is in contrast with the other colors of the widget.

The scope of the focusing is to understand where the trackball pointer is placed, and if it's possible to perform any action with the widget. If the widget is not enabled it's not possible to perform any action and the focusing doesn't work. When it is enabled again, the focusing will work and it will be possible to run the relevant action.

2.5.1.13 Clicking in the Argus Interface

In all the widgets where it is possible to perform actions it is not needed to double click. Every action can be made just by a single click. Most of the Buttons execute their actions when they are released. A Button, which works in a different way, is for example the "Heading Line On", which hides the Heading when pressed, so it has two actions: One is to hide the HL while it's pressed, the other is to display it again once it's released.

The "Decrease" and "Increase" functions of the Progress Bars and the Editable Labels are executed at the pressing. If the relevant SK is kept pressed, it will increase or decrease the value faster.

2.5.1.14 Cursor Shape

The trackball cursor changes its shape and color according to where it is placed.

Entering in the PPI Area the shape is a cyan colored cross, entering in the System Data Sections it is normally a large, black, up oriented arrow, but inside the Progress Bars, which accepts an input, it is a thin double horizontal arrow. In case the System has to STANDBY for a while, for example saving the setup, the cursor becomes a sandglass. Different shapes represent different operating ways. If the cursor is placed in PPI Area its shape is a cross and allows to perform standard tracking and navigational operations, such as acquiring and selecting targets, off centre the PPI, etc., when it's over a Progress Bar, its shape changes to a double horizontal arrow and pressing the left or right SK it is possible to decrease or increase the value of the Progress Bar (see Progress Bars paragraph).



Examples of cursor shapes

NOTE

The best way to operate the three push-buttons is to use two hands.

2.5.1.15 Menu Window

Basically, all opened Menus are windows, which have a Title in a color different to the rest of the window (pos. 1), a Back key (pos. 2) used to return to previous Menu and an Escape key (pos. 3) used to close the window. The remaining area (pos. 4) normally contains Buttons, Labels or any other kind of widgets or items.

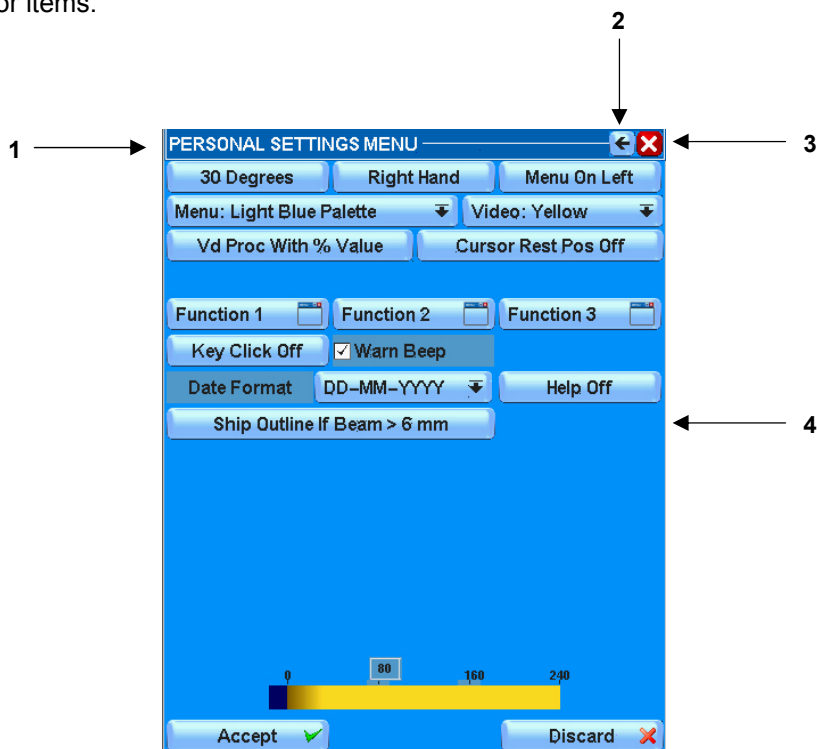


Figure 2.5.1.15.1 Menu Window: shape and items

2.5.1.16 The numerical / alpha numerical keyboard

When the operator selects a function (such as the Gyro Preset) and need to fill in data, a numeric or an alpha numerical keyboard will be displayed right above the Displaying Information Section (Figure 2.3.2, pos. 6). The operator will be able to enter the required data by means of pressing the numbers or the letters.

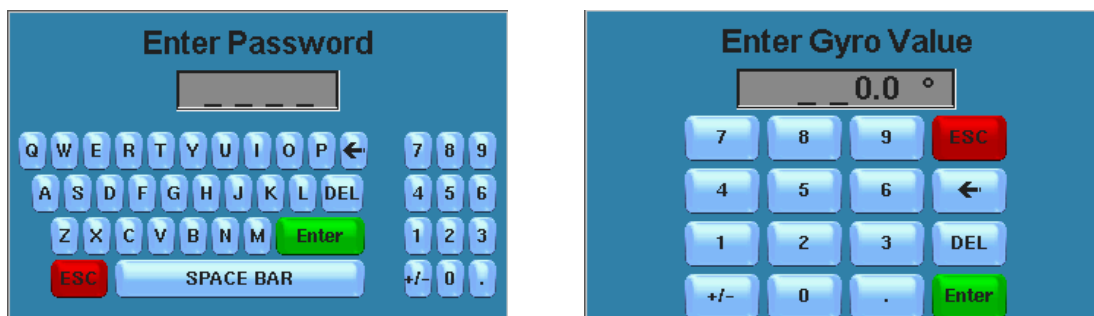


Figure 2.5.1.16.1 Alphanumerical and Numerical Keyboard, an Example

Many functions will display this keyboard and above the keyboard will be a help label suggesting what type of data to be inserted. The measurement unit (degrees, Kt, meters, etc.) will be displayed inside the data label (Figure 2.5.4.6).

By means of the keyboard and the cursor, the operator can fill in the chosen data, and once he presses enter, the inserted data will be applied. Should the inserted data exceed the maximum or minimum values, the System will limit the input to those values (i.e. 0 and 359.9 for gyro value).

In case the operator is entering a password and it is not the correct one, a Wrong Message error will be displayed. The ESC labelled button closes the window not applying the data. The Back Space button (labelled with a left arrow) deletes the last digit. The DEL labelled button deletes the entire data inserted. The ENTER labelled button accepts the data and stores it in the System.

2.5.1.17 The Button's label

Each Button is labelled, according to the function it is to perform.

The Button's label displays the actual status of the function being performed by the Button. This means that for example when the "*Heading Line On*" Button is labelled "On" the Heading Line is On and it's being displayed. When it's labelled "Off" the Heading Line is actually Off and it's not being displayed.

If "Help" Mode is enabled, hovering the cursor over the buttons located in the System Data Area, another Help label will be displayed, amplifying the information related to the function performed and labelled on each button.

On each button the operator can also find:

No Symbol (text only)

The status of the function performed by the Button is labelled in the caption of the Button (bi-stable Buttons, see Para. 2.5.1.2)

2.5.1.18 Small Menu-like Icon

If the button is labelled with a menu-like icon, clicking on it, the operator will see another window containing a new menu, with further information or options. For example the SYSTEM SETUP push-button: by pressing it, a new window with other Menu Buttons will be displayed. By pressing each item contained in this window, new sub-menus will be provided: entering in SYS VERSION the SYSTEM VERSION MENU window will be displayed (Menu Buttons, see para. 2.5.1.2)

2.5.1.19 Horizontal line with a down-oriented arrow Icon

If the button is labelled with a down-oriented arrow on the right, pressing the button, a List Box will be opened. Clicking e.g. the PAST POSITION button, a List Box will be displayed and the operator will have the possibility to select an item from the list, just by placing the cursor on one of the displayed options and clicking. To close the list not selecting anything, it will be enough to click again on the button or anywhere outside of the list (List Buttons, see Para. [2.5.1.2](#) and List Boxes Para [2.5.1.7](#)).

2.5.1.20 Symbols list

	CCRP / Antenna Position Reference	Para 2.5.5
	Heading line and PPI Graphics On / Off	Para 3.2.8.6
	Range Rings On /Off	Para 3.2.8.2
	Audio On / Off	Para 7.2.1
	True / Relative Vectors	Para 5.6
	Open Parallel Index Menu and Status	Para 4.5 - 2.5.6
	AIS Filtering On (Range) / Off	Para 5.1.3.3
	AIS Data On (AIS data source)	Para 5.1.3
	Disabled AIS Lost Alarm	Para 5.1.3
	Disabled AIS Danger Auto-activation	Para 5.1.3
	Presentation Reset	Para 3.2.8.4
	Sea Stabilization / ground Stabilization	Para 3.2.8.5
	System status / System failure	Para 7.1

2.5.1.21 Opening the Menu Windows

When operating with menus opened in the Displaying Information section and the operator opens another menu, the previous one is automatically closed.

2.5.2 Operating Procedure Mode, Section by Section

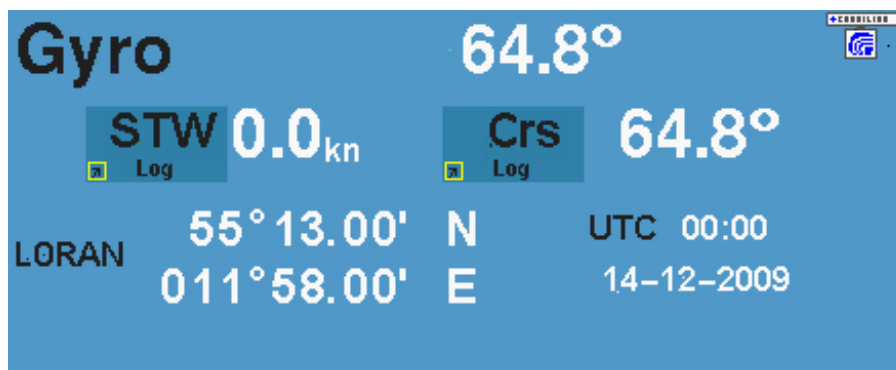


Figure 2.5.2.1 System Data Area – Own Ship Section

2.5.2.1 Own Ship Section

In this Section the operator has a fast read-out of all the information concerning Own Ship (Figure 2.3.2 and Figure 2.5.2.1).

2.5.3 Gyro & speed

Indicates the heading data received from the connected Gyro compass in degrees. If the information from the gyro compass is interrupted, or it is wrong or incorrectly connected, the gyro value label will show “---.-” in red color and a System Failure will appear, indicating a failure of the gyro.

When the IEC61162 sentence THS is the source of the heading information, the mode indicator field is checked against invalid data or low integrity data. In that case, the heading data is presented in red for invalid values and black on a yellow background for low integrity data.

2.5.3.1 Gyro Preset

The function of this menu is to set the proper angle between the ship's heading and North, in case of incremental gyro such as Stepper or Synchro.

Operating with an incremental gyro, the value provided by the gyro compass is only the incremental value (a fraction of an angle) and not the absolute value; therefore there is a need to provide a proper reference pre-setting of the heading value. In this way, changing the heading, the incremental value

will be added to the pre-set value. This value must be set at the start-up, after a blackout and after the storage of any Radar Setup setting.

In case of a Gyro serial signal (NMEA) this setting is not required, because the value provided is the absolute value (ordering 120°, the gyro will assume the heading 120°). In this case the Gyro Preset button is disabled.

To pre-set the gyro value, press the Gyro Preset button and a Numeric Keypad will appear above the System Setup Menu. The setting is provided manually, entering the value by means of the alphanumeric keyboard and pressing the Enter button (green).



Figure 2.5.3.1 System Data Area – Own Ship Section

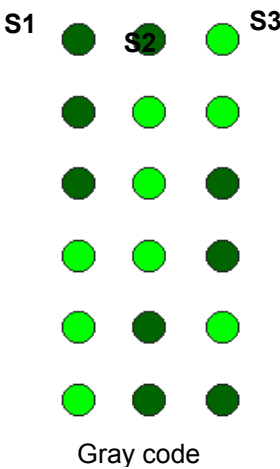
There could be several reasons why the value is not accepted by the system. If the Gyro field is in red background, the Gyro signal is in failure and the failure is briefly described in the field. The possible failures with incremental gyro are:

- Gyro No Preset. Means that the connections are detected correctly, but the operator need to preset the gyro value as described above.
- Gyro No Ref. Means that no reference is detected for the three phases of the gyro signal. A check of the phases is needed.
- Gyro Phase Error. Means that the three phases of the gyro signal all have the same voltage. This is also the failure given when no phase is connected (all at 0 V).

The three phases are given by the gyro with a 3 bit Gray code. The purpose of this code is to detect the increment of the value and its sign; its most important characteristic is that only one of the three bits at the time can change and in this application (normally it is not a characteristic of the Gray code), the 3 bits cannot all have the same level. Check the Gray code to see the four green LED on the Alpha board are o.k.:

1. The first one next to red LED is D33 and it indicates the first phase (S1).
2. The second one is D34 and it is the second phase indicator (S2).
3. The third one is D35 and it indicates the third phase (S3).
4. The last one is D36 and it is to indicate the Reference.

Move the gyro or somehow simulate a turn and the three LEDs (S1, S2 and S3) will start to change their state, it will be easy to observe that they never will be all on or all off, and only one at a time will change its state.



Obviously, to do this test, it is necessary to have an incremental gyro (i.e. stepper) correctly connected and set up.

2.5.3.2 Speed

It indicates the ship speed data from the speed sensor in knots. It also indicates if the value is entered manually. The speed description label indicates the type of value available, if entered manually or simulated. The possible speed sensors are indicated in the Table 2.5.1 and below are some examples of possible speed read-outs.

SPD

5.0_{kn}

Gyro

Hdg

318.4°

Gyro

Speed from a single axis speed log, in the Course field the gyro heading value is replied.

STW

4.9_{kn}

Log

Crs

316.3°

Log

Speed Through Water and Course, in this case the information are taken from the speed log.

SOG

5.0_{kn}

Log

COG

353.6°

Log

Speed Over Ground and Course Over Ground, if there is no info between parentheses the information are taken from the speed log (dual axis speed log, Log Ground Speed selected in Own Ship Set menu).

SOG

5.0_{kn}

Log

COG

353.6°

Log

Speed Over Ground and Course Over Ground, the type of sensor is briefly indicated between parentheses.

SOG

5.0_{kn}

Log

COG

353.6°

Log

Speed Over Ground and Course Over Ground, the information between parentheses indicate the equipment

ARGUS RADAR

General operation

which is sending the sentence (OSD sentence) and the type of sensor which it is getting the info from.



Manual Speed, the speed source chosen by the operator is the manual one.



Simulated Speed, the speed simulation has been turned on by the operator and it overruns any other kind of speed

chosen before (differently by the manual speed, with the simulated one, a movement of the ship is also simulated and the Lat / Lon info are computed).



Speed computed using a stationary target as reference.

Table 2.5.1 - Source Speed Conversion Table

SPEED SOURCE			ALPHANUM. SCREEN DISPLAY	TARGET TRUE SPEED	SPEED REFERENCE (OSD) *	
LOG	SINGLE AXIS		MANUAL DRIFT ON **	STW (LOG)	BT	W
			MANUAL DRIFT OFF **	SPD(LOG)	WT	W
	ANALOG DUAL AXIS			STW	WT	W
	SERIAL DUAL AXIS	WT CHOICE		STW	WT	W
		BT CHOICE		SOG	BT	BT
MANUAL SPEED			MANUAL DRIFT ON **	STW (MAN)	n.a.	M
			MANUAL DRIFT OFF **	SPD(MAN)	n.a.	M
ECHO REFERENCE SPEED				SOG(REF)	BT	R
EPFS SPEED				SOG(EPFS)	BT	P

- * WT = Water tracking log
BT = Bottom tracking log
M = Manually entered
W = Water referenced
P = Positioning system ground reference
R = RADAR tracking

- ** MANUAL DRIFT is considered: ON when MANUAL DRIFT SPEED $\neq$ 0; OFF when MANUAL DRIFT SPEED = 0

For example:

- If a Serial Dual Axis Log sensor and BT type has been selected, the indication will be: SPD (BT)
- for the ship heading speed, and for course and speed made good, the indication will be: **COG - SOG**

If a Single Axis Log sensor has been selected, the text in the related row is: LOG SPD, and for course and speed made good: SPEED – HDG.

2.5.3.3 Speed Source Selection

Open the Speed Source Selection Menu by pressing the “Speed Source Selection” (Figure 2.5.3.3.1). The main function of this menu is to select the possible and desired own ship speed source:

- Speed Log, if the speed log has the possibility, it is also possible to switch between ground and water speed value.
- Manual Speed, which is not allowed to use if using AIS on board.
- Auto Drift, which is not allowed to use if using AIS on board.
- EPFS Speed.

The speed source selected is indicated by the green “√” tick on the yellow background.

Furthermore, it is possible to set a Manual Drift speed and angle, but only with Manual Speed, Single Axis Speed Log or Dual Axis with transversal has no speeds available.

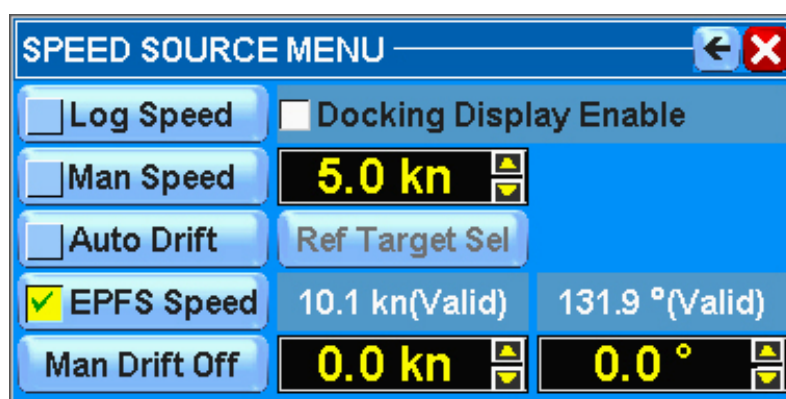


Figure 2.5.3.3.1 Main Menu Control – Speed Source Selection Menu

Selecting the Log speed source, the system will take the speed from the Log input.

2.5.3.4 Manual Speed

Selecting the Manual Speed, the value written in the label next to the Manual Speed Switch Button will be applied as ship speed; that value can be changed placing the cursor on the above mentioned label and following the suggestion of the Help Line, which will say “Decrease”, “Enter Value” and “Increase” (see Figure 2.5.3.3.1 and near table), then press the left or right SK to decrease or increase to the actual value or press the centre SK to enter directly a new value by the Numeric Keypad, which is the same as for the Gyro Preset. Note that the Manual Speed is an evaluated speed, unsettled and inaccurate; for this reason, some operations cannot be performed with manual speed. This can be for True Vector presentation and if on-board AIS is ON.

2.5.3.5 Auto Drift Speed

The Auto Drift Speed can be selected to compute own ship's speed (in case of speed log failure) using as reference a stationary target. Selecting the Auto Drift Speed, the system will calculate the ship's speed relative to the Reference Target. The Ref. Target can be set by pressing the "Ref Target Sel" labelled button when the interesting target is the last selected (the one in the first column of the Target Data Window) which can be called Reference Target and be recognized by a square flashing around it and an "R" inside the square at the top right corner. Obviously, the Reference Target must not be moving, otherwise the speed computed is the sum of the two speeds of Own Ship and the Reference Target, and the Radar Target track must be steady (must be tracked for at least 3 minutes)

The procedure for using the Auto Drift should be as follows:

1. Acquire a complete stationary echo (e.g. a buoy).
2. Wait about 3 minutes, until its symbol changes from  to .
3. Select it and press "Ref Target Sel" and the symbol will change to  with a flashing square around (selection).
4. Select "Auto Drift" and the speed displayed in Own Ship Window will be the result of the calculation of the Ref Target relative speed inverted by 180 degrees.

Pressing "Ref Target Sel" with no tracked target, or no target selected or a moving target selected, the system will indicate "Wrong: No Steady Target" in the Wrong Order Area (see Figure 7.2.4).

Selecting Auto Drift with no Reference Target, the system will indicate "Wrong: No Reference Target" in the Wrong Order Area (see Figure 7.2.4).

Also, this kind of Speed source is not allowed if AIS is ON.

When the speed source is the reference target, the value is calculated filtering the difference of relative position between the reference target and Own ship. Consider that the position precision is proportional inverse to distance because the measurement in azimuth depends of the Radar antenna beamwidth multiplied by the range.

Good reference target speed is obtained from acquiring and tracking near echoes with small area but with good Radar reflectivity.

WARNING

The echo used as reference must be a stationary target, otherwise all speed calculated will not be true, but only relative to the reference target. It is wrong to select a ship that is anchored as a reference; no alarm will be signalled when the ship starts to move and all the calculated true speed will change to erroneous values. The reference echoes should never be used to calculate relative speed. This data is not following a speed change with adequate accuracy for an anti-collision system.

WARNING

When the reference target is lost, the speed source will automatically be switched to LOG. If the LOG is working on water track, the speed mode will become sea stabilised.

Selecting the EPFS Speed, own ship's speed is taken by the speed information coming from the connected Positioning Source (i.e. GPS). The sentences accepted on the EPFS serial port as source of speed are VTG and RMC.

When an EPFS is used as speed source, that speed is calculated filtering the variation of position of the ship. Considering that EPFS position resolution is around 10-20 m, and the speed measured is less than 1 KN, the course inaccuracy will increase relative to a decreasing speed.

In case none of the above sentences are available from the EPFS, but the system is connected to an AIS receiver, the EPFS source speed can be given from the VDO sentence of the AIS. In this last case the "EPFS Speed" labelled button changes to "AIS Speed".

Choosing the EPFS speed, with any of the above sentences, the speed and course values are handled as if they came from a Ground Stabilized Dual Axis Speed Log, and the label next to the speed and course values in Own Ship window change to "STW" and "Crs" (par.).

If any of the above sentences are available, the values of the usable speed and course are displayed in the labels placed on the right of the "EPFS Speed" labelled button (Figure 2.5.3.3.1) and their validity is displayed there as well.

☒ EPFS Speed	4.3 kn(Valid)	158.5 °(Valid)	Valid EPFS Speed and Course
☒ EPFS Speed	--.- kn	----.-°	No EPFS Speed Information
☒ EPFS Speed	4.3 kn(Not Val)	158.5 °(Not Val)	Not Valid EPFS Speed and Course
☒ AIS Speed	0.1 kn(Valid)	184.7 °(Valid)	Valid AIS Speed and Course

Figure 2.5.3.5.1 System EPFS

Using the manual speed or a single axis speed log, it is also possible to enter a Manual Drift, pressing the Manual Drift On/Off button and entering the correct values in the labels next to it. The way to enter the values is exactly the same as for entering manual speed.

Using the EPFS Speed or a Dual Axis Speed Log the “Manual Drift” button is disabled (Figure 2.5.3.3.1).

Note that the default source of speed is the Speed Log, and it is the one selected after every start-up; after a switch from standby to TX-On the last selection is reloaded.

NOTE

An SDME speed over the ground based on acoustic sensors has limited depth range and may in specific cases be affected by poor acoustic conditions due to e.g. air or ice below the sensor.

NOTE

The speed through the water measured close to the hull is affected by tide and current and will from time to time differ significantly from speed over the ground. An SDME measuring speed through the water may in specific cases be affected by poor conditions due to e.g. air or ice below the sensor. If the sensor measures only the longitudinal component of the speed, the athwart ship component is unknown to the Radar.

2.5.3.6 Course

It indicates the ship's course according to the speed source selected. Obviously, in case of single axis speed log, the course field shows the gyro value.

2.5.3.7 Latitude - Longitude

It indicates the ship's Latitude, and Longitude, data incoming from an EPFS (i.e. GPS).

Invalid data is displayed in red, low integrity data in black on a yellow background.

When the EPFS is not available or in timeout, the geographic position value is replaced with a red --.—

2.5.3.8 UTC or Local Time

The Date and Time indicated can be switched between UTC and Local Time, manually entered or received from the EPFS; this selection can be performed using the shortcut suggestion from the Help Line, when placing the trackball cursor on the label, which says "UTC" or "Local Time". Pressing the left SK when the correspondent suggestion says "Time Setup", the "Date and Time Settings Menu" will be displayed and the operator will have the possibility to change the following:

- Choose to display UTC or Local time; the local zone time shift info is normally sent by the ZDA sentence.
- Set a manual Local Zone if for any reason the local zone time shift info is not available (it can be applied to the Manual Time also).

The changes are applied immediately, but to store them in the memory and reload them after a restart, the "Accept" button must be pressed.

Note that the manual date and time are not stored in the memory even if pressing the "Accept" button, due to the fact that the system is not able to run the clock while it is turned off.



Figure 2.5.3.2.5 Date and Time Settings Menu

2.5.4 AIS

The AIS label shows the AIS operating mode. If an AIS device is connected, a progress bar indicating the number of targets will be displayed, otherwise the information displayed is "OFF" (Figure 2.3.2). The maximum number of targets that can be acquired is 200; reaching 95% of the maximum, the progress bar will change to yellow, to warn about the near limit. And reaching 100% it will change to red, to indicate the reached limit. It is possible to set the priority of AIS targets by their RANGE, CPA

and TCPA. It is also possible to filter AIS targets by RANGE, CPA, TCPA, CLASS A, CLASS B and SPEED. Detailed explanations about AIS priority and filtering are provided at par. 5.1.3.3 . The General AIS information are provided in par. 5.1.3.1.

2.5.4.1 Target Tracking

The TT label indicates how many targets have been acquired. If there are no acquired targets, the label will indicate “STBY”. Otherwise, a progress bar indicating the number of targets will be displayed. As for the AIS label, reaching 95% of the maximum targets that can be processed (40), the progress bar will change its color to yellow, and reaching 100% it will change to red.

2.5.4.2 Target Track and AIS Association Mode

A symbol is displayed to indicate the data source when an associated target is selected.

2.5.4.3 Map Name

The name of the map currently displayed (if any).

2.5.4.4 Help Line Section

The function of the Help Line (Figure 2.3.2) is to make suggestions to the operator on the actual functions of three mouse buttons. The main functions are described in Para. 2.5.1.10.

2.5.4.5 Operating Mode Section

There are two Switch Buttons under the help line (Figure 2.3.2) with which it is possible to select “Track Mode” or “PPI Mode”. The Help Line will change consequently (par.2.5.1.10).



Figure 2.5.4.5 Operating Mode – Detail

2.5.4.6 Cursor Section

In the Cursor Section (Figure 2.3.2) of the System Data Area all the Parameters relevant to the cursor are displayed. The information displayed are described in the following sub-paragraph.



Figure 2.5.4.6 Data System Area – Cursor Section

2.5.4.7 Cursor

The Cursor Polar Position (Range and Bearing) is displayed and it can be switched between True and Relative. Obviously, if the gyro is faulty, the True information is not available.

2.5.4.8 Latitude and Longitude or ETA and TTG

These fields normally indicate the Geographic Position of the Cursor (Cursor must be inside PPI area and valid EPFS data available).

The EPFS position depends also of the datum (DTM) used.

The DTM sentence is processed and evaluated. Latitude and longitude will not be accepted and presented when:

- the reference datum is different from WGS-84,
- no datum has been received or the offset is missing and the local reference is not WGS-84

The position background changes to yellow when the local datum is different from WGS-84 and the latitude and longitude are changed according to the datum offset.

ETA and TTG to the cursor position can be calculated and displayed. And the switch between the two presentations can easily be performed moving the trackball on the "Latitude" and "Longitude" labels and watching at the Help Line. The Help Line related to the left SK will indicate "ETA / TTG" (in case the presentation is already for ETA and TTG it will indicate "Lat / Lon").

In ETA and TTG mode the system will indicate the estimated date and time of the eventual arrival at the point where the cursor is placed (ETA, expressed in hh-mm dd-mm-yyyy) and the time needed to arrive at that point (TTG, expressed in dd hh-mm).

To display ETA and TTG the cursor must be placed inside the PPI at a bearing of $\pm 45^\circ$ relative to Own Ship course.

NOTE

The ETA can be displayed only if an external time source is connected (i.e. GPS) or a manual date and time are set.

NOTE

Both ETA and TTG are not displayed if the speed source is at fault or if the speed is lower than 0.1 KT.

2.5.5 CCRP Position (Consistent Common Reference Point)



By pressing this button it is possible to change the CCRP Position between the Conning Position and the Radar Antenna.

Every measurement made with cursor, or EBL VRM etc. is always referred to CCRP (wheel symbol). The PPI origin is always on the radar antenna position, in both modes.

By pressing this button it is possible to change the CCRP Position between the Conning Position and the Radar Antenna Position. Changing the CCRP position will modify the reference of any angles and distance measurements e.g. bearing scale, range rings, targets distance, ERBL, etc.

For optimal CCRP presentation the Radar sensor should be aligned in position and every range delay or azimuth skew should be compensated. These settings are made during the installation setup and all the Radar display configuration can be saved and shared with other displays via a USB memory module.

When the selected transceiver is changed, the configuration for that unit is automatically read from the setup and applied to the picture so that the PPI center is consistent for all selected Radar TXRX and for each console on the bridge.

NOTE

In True Motion and when the CCRP, due to the position of the Radar antenna or the range scale in use, is located at more than 50% of the PPI radius, the Reference will change automatically to Antenna Reference. When this condition is not true anymore, because the range scale was changed, the reference is again automatically switched to the CCRP. This check is made to avoid loss of radar PPI visibility in front of the ship or incorrect presentation of the bearing scale.

2.5.6 Parallel index menu



In the Graphic Symbols Menu, it is possible to set up four Parallel Indexes. The Parallel Lines function shows the distance between own ship and the coastline, or one or more ships when navigating. This function is particularly useful when navigating in limited or restricted waters and navigating in a traffic separated zone. For more information, see (Parag.4.5)

2.5.7 Main Menu

The Main Menu control section (Figure 2.5.7) is activated by pressing the Menu button on the screen, and it consists of the following submenus for various System Menu Controls:

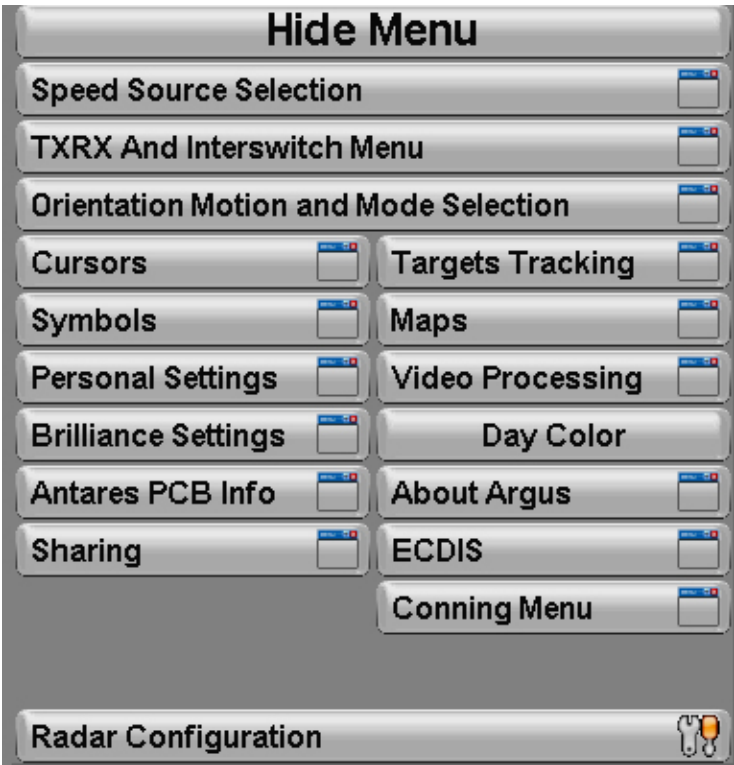


Figure 2.5.7 System Data Area – Main Menu Control

- | | | | |
|---|------------------|-----------------------|------------------|
| - Radar Configuration | (Para. 2.5.8); | - Personal Settings | (Para. 2.5.8.1); |
| - Speed Source Selection | (Para. 2.5.3.3); | - Video Processing | (Para. 3.3); |
| - TXRX and Interswitch Menu | (Para. 3.7); | - Brilliance Settings | (Para. 2.5.8.2); |
| - Orientation Motion and Mode Selection | (Para. 3.2); | - Day Color | (Para. 2.5.8.3); |
| - Cursor | (Para. 2.5.4.7); | - Antares PCB Info | (Para. 2.5.8.5); |
| - Target Tracking | (Para. 5.1.1); | - About Argus | (Para.2.5.8.7); |
| - Symbols | (Para. 5.23); | - ECDIS | (Para 2.5.9); |
| - Maps | (Chapter 6); | - Conning Menu* | (Para 2.5.10); |
| - Sharing | (Para.2.5.8.6) | | |

*Valid configuration in case of wide screen; see table in paragraph 1.2.1

2.5.8 Radar Configuration

Entering in this Menu, a new window will be displayed and a password will be requested in order to fill in the data in the proper window. The reason is, that the data insertion is a very delicate operation and therefore is restricted to skilled operator and factory personnel, and used only during the set-up of the system, which normally is performed only at the installation.

In case the operator needs to use the Radar Setup Menu for any reason, we suggest not to touch any parameter without the help of an authorized technician.

2.5.8.1 Personal Settings

Pressing the “Personal Settings” button, the following window will be displayed.

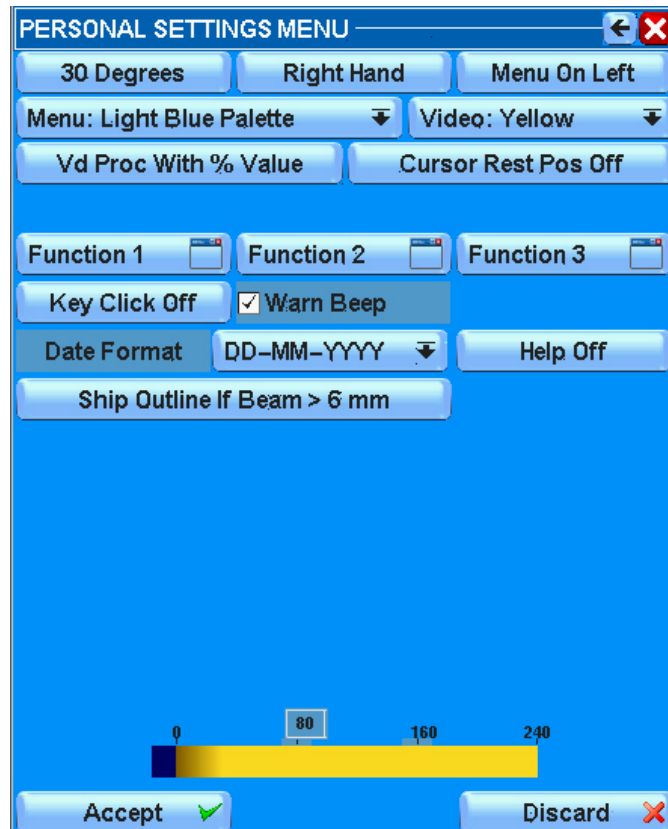
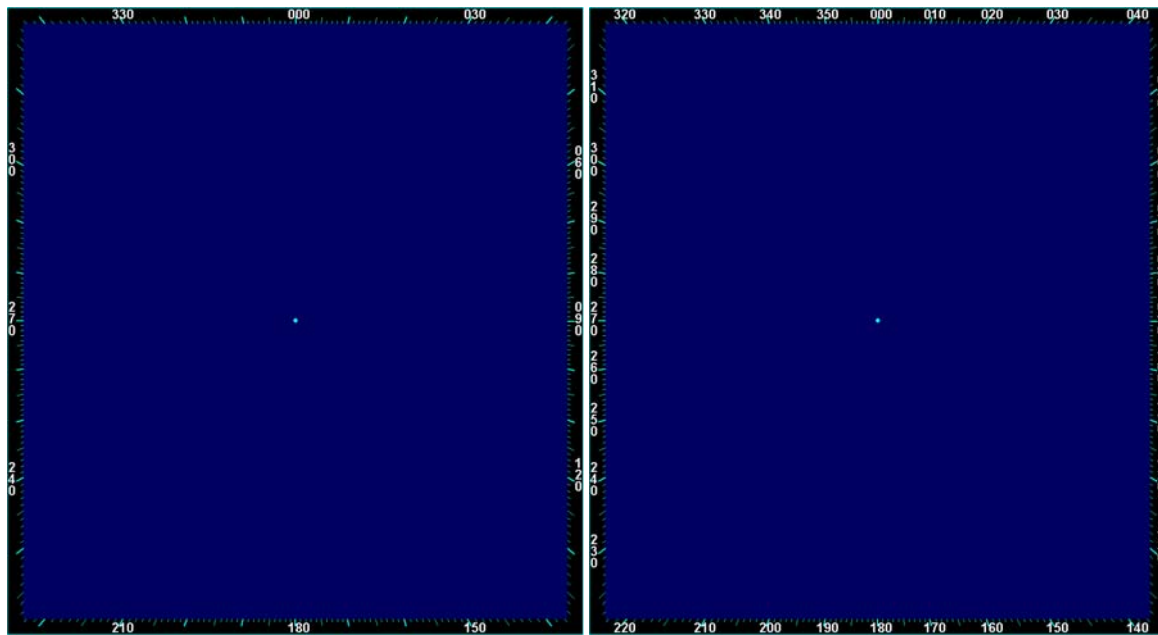


Figure 2.5.8.1 Personal Settings Menu

This menu gives the possibility to customize the Argus Graphic Interface, changing the colors, the brilliance of a part of the interface and so on. Obviously, these settings depend on the preferences of the operator. The purpose of this menu is to cover the preferences of as many operators as possible. The following sub-paragraphs provide instructions on how to perform these preferences.

2.5.8.1.1 Bearing Scale Accuracy

Around the PPI window the degrees are indicated on the Bearing Scale. The values are normally set for every 30 degrees. The first button on the left top corner of the View Options Menu changes the reading to be for each 10 degrees, as shown in the following figures.



30 Degrees

Figure 2.5.8.1.1

10 Degrees

Figure 2.5.8.1.1.1

2.5.8.1.2 Right / Left Hand Mouse Operative Mode

The button in the centre of the first row, normally labelled as “Right Hand”, switches the trackball operative mode between Right and Left hand, interchanging the functions of the Left and the Right SK.

This way, most of the functions described in Para. 2.5.1.2 have to be flipped horizontally if Left Hand is chosen; e.g. “Tgt Acquire” must be exchanged with “Tgt Cancel”, but “Decrease” always remains on the left and “Increase” always on the right.

This setting will have effect after a restart of the system, it is not possible to see the effect in real time.

2.5.8.1.3 Menu on Left or Right

The button placed on the right of the first row (Figure 2.5.8.1), normally labelled as “Menu On Left”, moves the Menu Bar (or System Data Area, Figure 2.3.2) on the left (Figure 2.5.8.1.3) or on the right (Figure 2.5.8.1.3.1) of the PPI, as preferred by the operator.

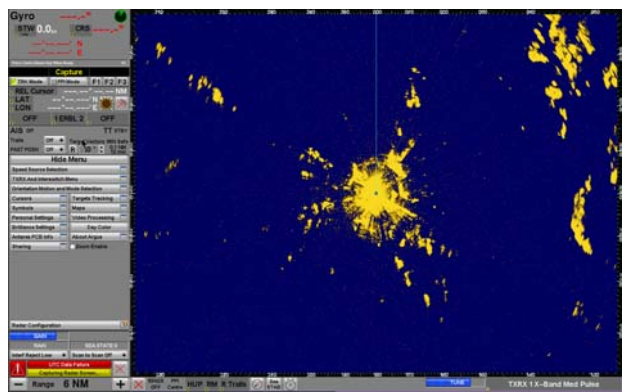


Figure 2.5.8.1.3

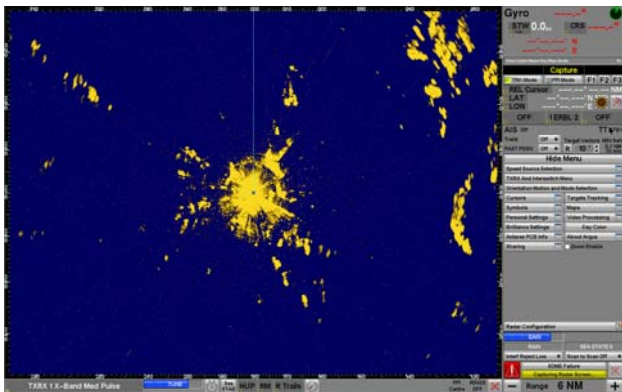


Figure 2.5.8.1.3.1

This setting will have effect after a restart of the system, it is not possible to see the effect in real time.

2.5.8.1.4 Video Processing Bars With or Without Percentage Value

The only button placed in the video processing (Figure 2.3.2), allows to show or not, the percentage values in the video processing bars.



It is normally not needed or required by any rule to show these percentage values, but if the operator prefers to have them displayed, he can easily do so by using this button; just be aware that, in the tuning bar particularly, the value changes continuously while the antenna is turning.

2.5.8.1.5 Menu Color Palette

Pressing the button indicating the Menu Palette, a list will open with the following options:

1. Menu: Light Blue Palette - Dark blue.
2. Menu: LightGreen Palette - Dark Green
3. Menu: LightGray Palette - Dark Gray

Choosing one of the above options from the list, the colors of the Graphic User Interface will change consequently as shown in the following pictures.



Figure 2.5.8.1.5

2.5.8.1.6 Video Radar Color Palette

Pressing the button indicating the Video Radar Palette, a list will open with the following options:

1. Video Radar: Yellow.
2. Video Radar: Green.
3. Video Radar: White.

Choosing one of the above options from the list, the colors of the only Video Radar will change consequently as shown in the following pictures.

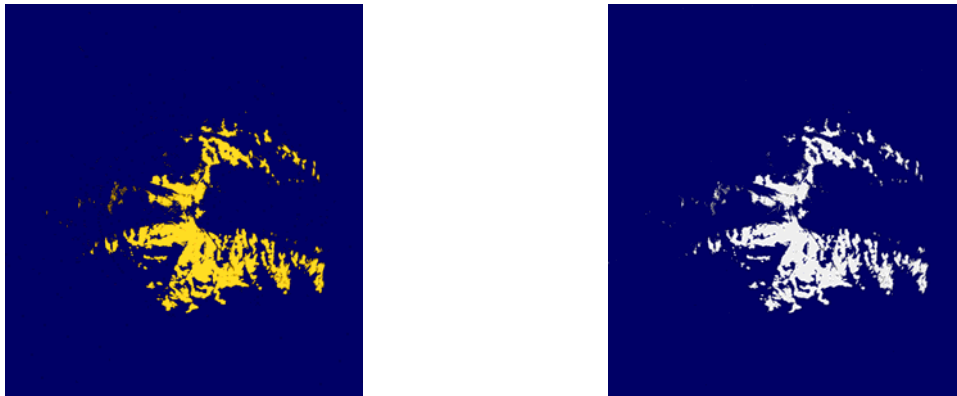


Figure 2.5.8.1.6

2.5.8.1.7 Cursor Rest Position

The function of this button is to define a position for the trackball pointer to move to after a defined timeout; this function allows the operator to always know the exact position of the cursor. To turn on the Cursor Rest Position function, press the “Cursor Rest Pos Off”, which will change to “On” and another button and another label will be displayed on the row below the button, as shown in the next picture.

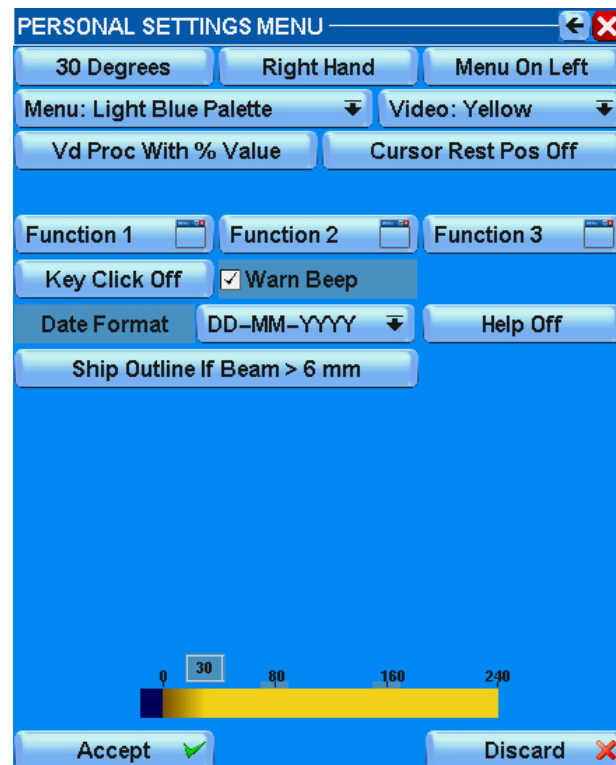


Figure 2.5.8.1.7

Now, pressing the “Set Rest Position” button, the system will enter in the Rest Position Storing mode and the left label of the Help Line will indicate “**Rest Pos**”. In this mode, by means of the left SK the Cursor Rest Position can be stored with a simple click of the left SK, leaving automatically the Rest Position Storing mode. To change the timeout of the cursor, just enter the desired value in the correspondent label (see above Figure).

2.5.8.1.8 User Functions

In order to avoid repetition of procedures specific to the desired operating mode, it is possible to save and recall specific operating functions, whenever the operator wants to. There are three keys, which allow recalling these functions. They are called User Function Keys FK1, FK2 and FK3.

In the System Setup Menu, there are three buttons in the last row: Function 1, Function 2, and Function 3 (Figure 2.5.8.1.7). When pressing one of them, a new window with 6 buttons will be displayed. When pressing any of these 6 buttons, a pup-up menu will appear displaying a list of

selectable functions. This gives the operator the possibility to store up to 18 functions (6 functions for each of the three function keys), which can be quickly recalled by pressing the push-buttons “Function 1”, “Function 2” or “Function 3” of the Keyboard (Figure 2.2.2, pos. 1) or the buttons “F1”, “F2” and “F3” placed under the Help Line in the System Data Area (Figure 2.3.2, Help Line).

To change a function from the list, press one of the 6 list buttons of the “Function Key Menu” and the pop-up menu list will open, as shown in Figure 2.5.8.1.8. Choose a function from the list, and select it.

After all 6 buttons in a Function key have been chosen, the Accept button has to be pushed, to store the Function key content in the setup content file, in order to be recalled after a system restart. Note, that the same function could be stored more than once in a FK, e.g. if “True Vector” is stored on all of the 6 functions of FK1, pressing FK1, the vectors presentation is changed to True mode 6 times, with no other change visible to the operator. Note also, that some functions in the list are complementary, in this case one overwrite the other one, e.g. if in the first button “Range 24 NM” is selected and in the second one “Range 3 NM”, by pressing the relevant FK, the range is set first to 24 NM and immediately after to 3 NM, with no change visible for the operator.

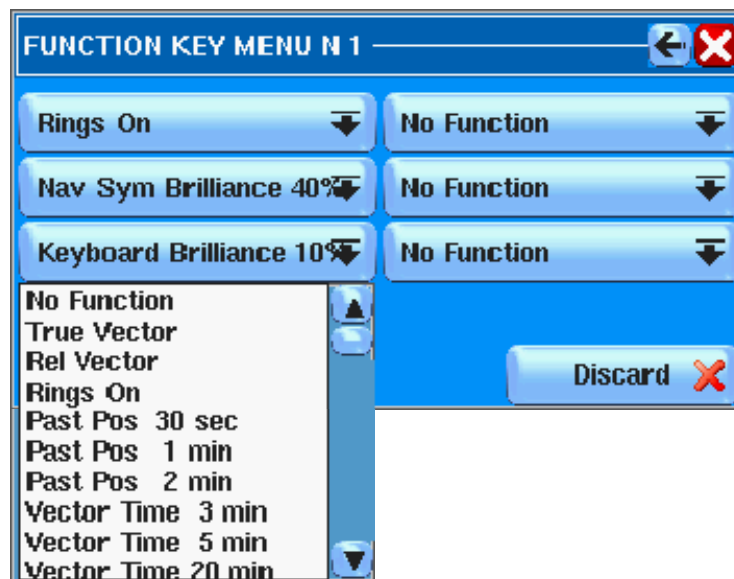


Figure 2.5.8.1.8 Function Key Menu

After the functions have been stored (selecting them by the list and pressing “Accept”), all 6 functions can quickly be set/activated, just by pressing the corresponding FK. For example, the Vector presentation is set to True motion, the Orientation and Presentation of the PPI is set to North Up, True Motion, True Trails, the colors are set to Day, and so on up to the 6th function, which is Scan to Scan On, 1 scan.

Once the FK1 has been pressed, the above functions are executed and the “F1” button changes its background to yellow, which means that it is the one activated.

Now, if the FK1 is pressed again, the system deactivates the functions from FK1, and restores the system situation as before the FK1 button was pushed. The yellow background disappears from FK1.

This does not mean that the complementary functions to FK1 will be activated. For example, if FK1 sets the vectors, to “True Vectors”, and the vectors were set also to “True Vectors” before FK1 was activated, after pressing FK1 the second time, the vectors will stay “True Vectors”.

2.5.8.1.9 Date Format

By pressing the button indicating the date format, a list of possible date formats will open, allowing to select the preferred type :

- Date-Month-Year (DD-MM-YYYY)
- Month-Day-Year (MM-DD-YYYY)
- Year-Month-Day (YYYY-MM-DD)

2.5.8.1.10 Key Click Off / On

The function of this button is to enable / disable the beep sound when pressing any of the push-buttons.

2.5.8.1.11 Ship Outline Beam

This setting is useful to override the standard behaviour described by IEC62388, only the ships having a scaled beam > 6 mm are displayed with proportional outline. This condition is usually reached only in the lowest range scale. To permit a ship outline visualization also in other range scales, the limit can be set alternatively to > 2 mm.

2.5.8.2 Brilliance Settings

The function of this button is to adjust the brilliance value individually for six different types of objects. The objects are: Menu, Keyboard, Rings, Navigation Symbols, Radar Target Symbols, ERBL and the Radar video.

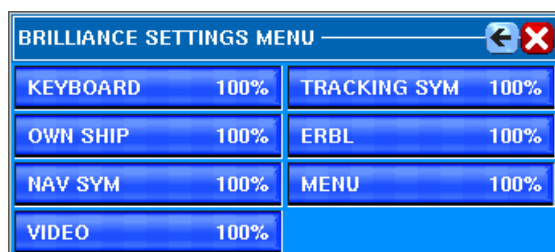


Figure 2.5.8.2 Brilliance Setting

Pressing the “Brilliance Settings” button, the BRILLIANCE SETTINGS MENU will be displayed and

the brilliance percentage values of the known six sections are visualised inside the correspondent progress bars. Placing the cursor over one of those progress bars, the trackball pointer will become a doubled left-right oriented arrow and the operator will be able to decrease or increase the values (par. 2.1.5.9 for more info about progress bars).

2.5.8.3 Day Color

Toggling this button, the operator, according to the light of the current time, can quickly adjust the Monitor background color. The selection is between Night and Day options. The Night PPI background color is much darker than the Day setting. The button is also on the keyboard (Figure 2.2.2, pos. 8)

The default color is set to Night, in order not to disturb the operator if the System is powered up at night time, so at every new power up of the system, the system is set to Night color with low intensity. To quickly switch to Day, press the “Day / Night” push-button on the operating panel or press the centre SK right after the long beep of the power up.

For the Dark Palette of the menu, there are no evident difference between day and night colors.

NOTE

The Night PPI background color is characterised by higher contrast and lower lighting, compared to the day setting. The Day PPI background color is characterised by higher brightness and lower contrast, compared to the night setting.

2.5.8.4 Help Off / On

Each button is labelled in order to visualise the main function it performs when pressed. If this function is activated (“Help On”), further information is provided when hovering the cursor over the buttons for more than 1 second. A Help label will be displayed, enhancing the information for the button where the cursor is positioned.

2.5.8.5 Antares PCB Info

By pressing this button, various information about the status of the main board will be displayed, the name of the board, its revision, the serial number and some internal temperatures and voltages. This information can be helpful for the operator or the service technician, to understand where a possible problem is.

ANTARES PCB INFO MENU			
PCB Name	ANTARES	PCB Temp	36.00 °
Revision	A	FPGA Temp	61.48 °
S/N	AH101	V1.5	1.53 V
StBy	43 min	V2.5	2.50 V
TxOn	38 min	V3.3	3.27 V
Monitor		V5	4.95 V
size	255x255 cm		

Figure 2.5.8.5.1 Antares PCB info

2.5.8.6 Sharing

CONFIGURATION SHARING MENU	
Before proceeding with this functionality be sure to "see" all the consoles in the "IP Addresses Config Menu". Then press "Send Configuration" to send the actual configuration of this console to all the other ones"	
Parameters To Synchronize: ☐ Video Maps ☐ Conning Task Configurations ☐ Personal Settings Synchronize	
Parameters To Keep Synchronized: ☐ Day / Night Control	
Accept ✓	Discard ✗

Figure 2.5.8.6.1 Configuration menu

In this mode, after setting the Video maps, Conning Task Configurations and Personal settings on the radar, you can then share these settings with other existing stations, simply by pressing the Synchronize key. Once you have sent the new configuration, the recipient has to accept it by consenting to the new setting.

However, in the case of the "Day / Night Control" parameter, when this is set on any machine, it is automatically changed on all others, without any consent request.

2.5.8.7 About Argus

The function of the About Argus menu is to recognise the Program and the Version running within the System. This Menu summarises all the programs running within the System, as well as the model of different hardware components and the serial number of the ANTARES Board (ex. G297)



Figure 2.5.8.6.1 System Parameter – System Version Window

2.5.9 ECDIS Interface Functions

When the unit is configured to be connected with ECDIS, a new push-button will be available in the lower part of the main menu. Press the ECDIS push-button to opent the ECDIS menu.

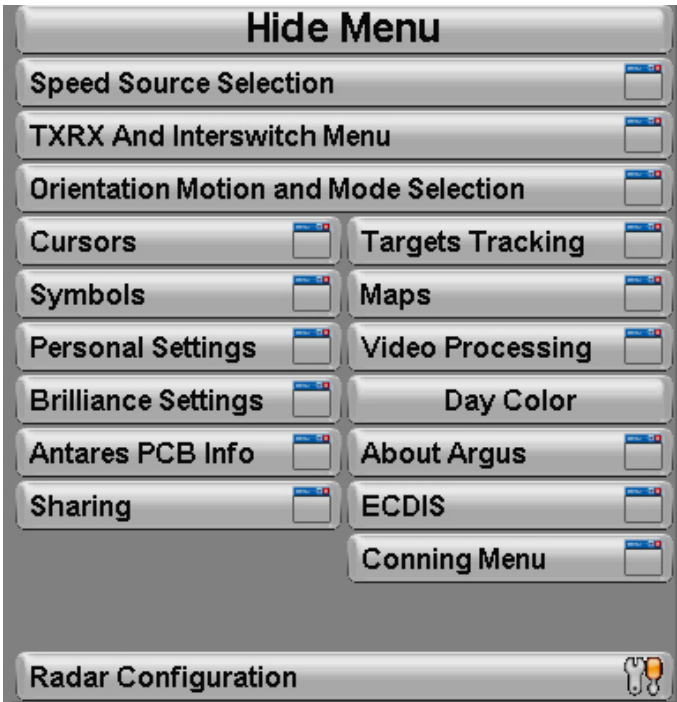


Figure 2.5.9 Main Menu with ECDIS

The menu contains two checkboxes to enable streaming of the synthetic video to the ECDIS console. The point to point connection address of the ECDIS console is defined under the “Radar Configuration” menu. See the Installation Manual for a description of the ECDIS connection setup.

Up to two video streams to two ECDIS consoles are available. Figure below shows the Menu when two ECDIS LAN destinations are configured in the Radar Setup.

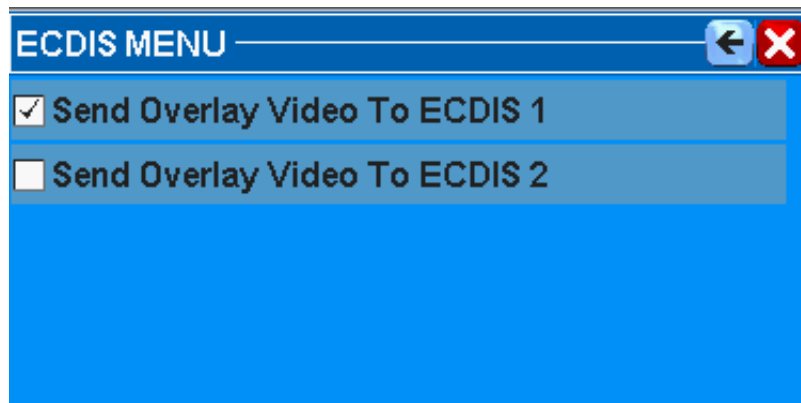


Figure 2.5.9.1 ECDIS Menu

2.5.10 Conning Menu

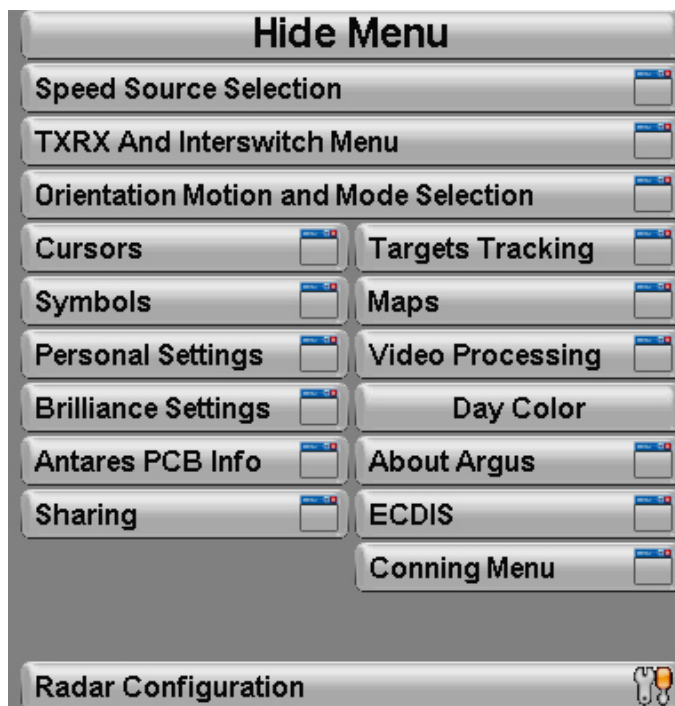


Figure 2.5.10.1 Conning Menu

This button is only available for the wide screen system.

In this mode, the operator can configure the available areas on the System Data Area Section, entering the tasks to be set into the dedicated areas. The sensitive areas for which we can configure our Tasks have been highlighted in the figure below .

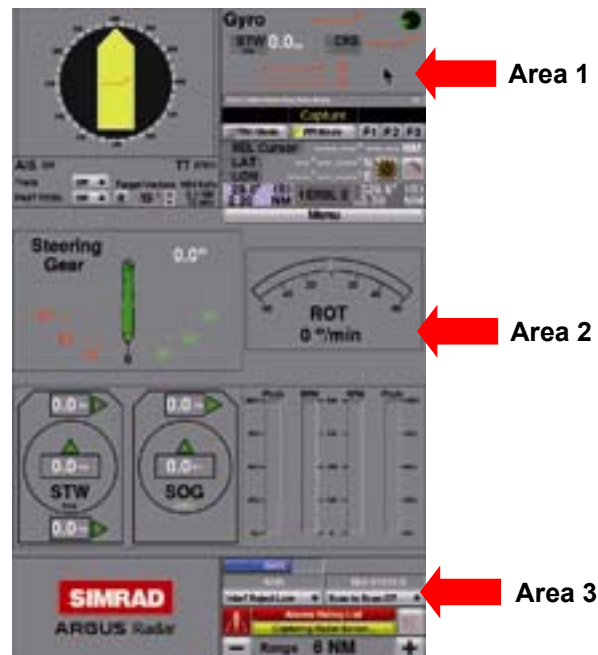


Figure 2.5.10.2 Settable areas

Each area can host a precise number of tasks, such as:

Area 1 (Up to a maximum of 4 Tasks)

Area 2 (Up to a maximum of 8 Tasks)

Area 3 (Up to a maximum of 2 Tasks)

By entering the Conning Tasks menu configuration, you can enable the “Conning Task Editing mode”. This function means it is possible to intervene in each of the three areas by inserting the required tasks, simply selecting them from a list, which is opened each time the trackball’s center key is pressed.

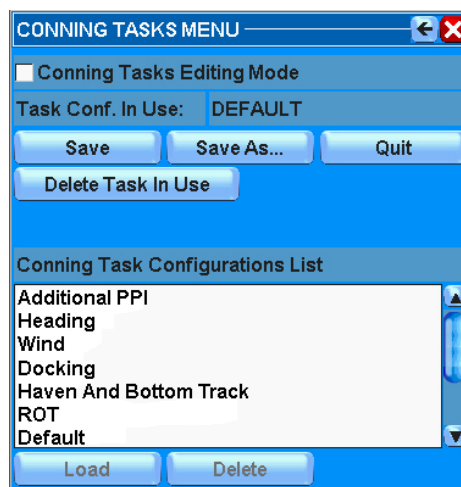


Figure 2.5.10.3 Conning tasks menu (CHANGE)

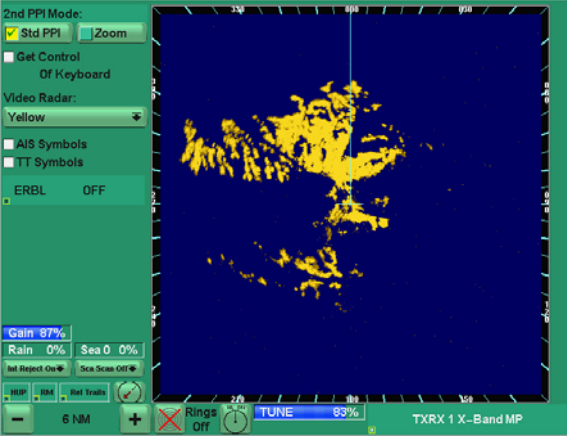
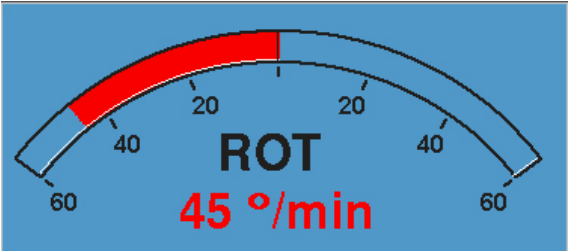
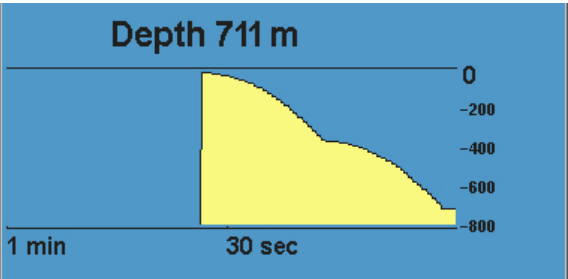
ARGUS RADAR

General operation

From this menu it is also possible to save the set configuration by pressing the “Save As “ button and using the display keyboard that opens in the System Data Area, to type in the desired name for this type of configuration, e.g. DEFAULT”. In this mode, it is possible to save up to 16 configurations.

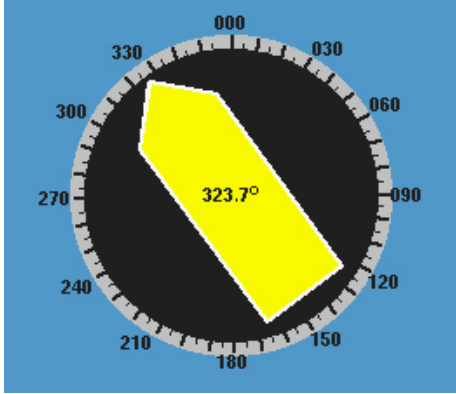
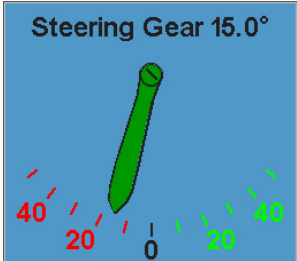
To re-use this type of configuration, just search for the previously saved name and press the “Load” key. To delete a stored configuration, once it has been found and the name selected, press the “Delete” key. To change the configuration set previously and to load another one from the “Conning Task Configurations List”, press the “Quit” key and load an existing configuration from the list, such as: “Environment, Docking” etc., for example.

Conning task list table:

TASK	DESCRIPTION
	Additional PPI: The window shows an alternative viewing possibility to the first PPI. (For more details see para.2.5.11).
	ROT: The window shows the ship's rate of turn
	Depth: The window shows depth sent from the echosounder.

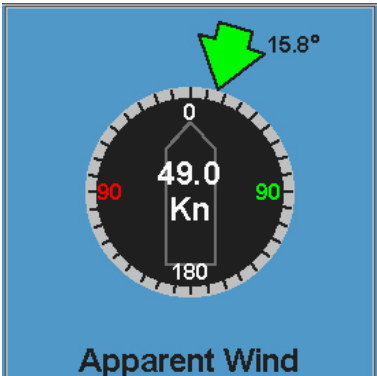
ARGUS RADAR

General operation

	Heading: The window shows the ship's heading in relation to geographical north.
	Haven and bottom Track: The window shows the speed through water (STW) and the speed over ground (SOG).
	Docking: The window shows the speed over ground (SOG); this is used during docking manoeuvres.
	Steering gear: The window shows the rudder position.

ARGUS RADAR

General operation

	CCTV: The window shows images from one or more closed circuit tv cameras placed on the vessel.
	Wind: The window shows the wind direction relative to the vessel.

2.5.10.1 Task window movement

Once a task has been selected, in one of the sectors mentioned in paragraph 2.5.10, can be moved inside the sector itself; positioning the cursor at the top left-hand corner of the task and pressing one of the two “Operating Push-buttons” it is possible to drag and drop the selected task window using the trackball (see figure 2.5.10.1.1).

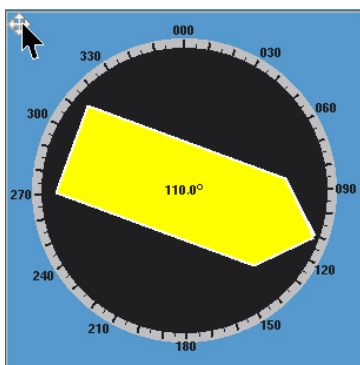


Figure 2.5.10.1.1

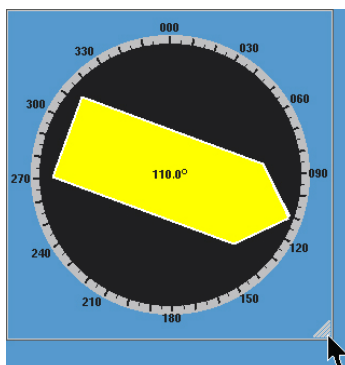


Figure 2.5.10.1.2

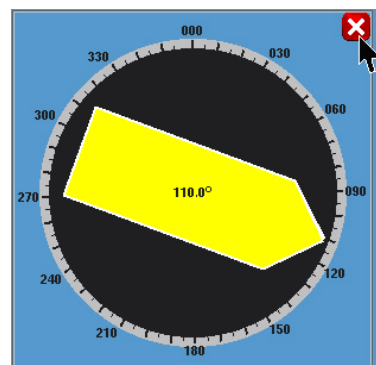


Figure 2.5.10.1.3

Selecting the bottom right-hand corner of the task window, it is possible by pressing one of the two

“SK keys” and using the trackball, to rescale the task window in proportion (see figure 2.5.10.1.2). To close the task window, click on the “x” in the top right-hand corner of the window using one of the two “SK keys” (see figure 2.5.10.1.3).

This function is only possible when selecting the first window “Conning Tasks Editing Mode”.

2.5.10.2 Picture in Picture

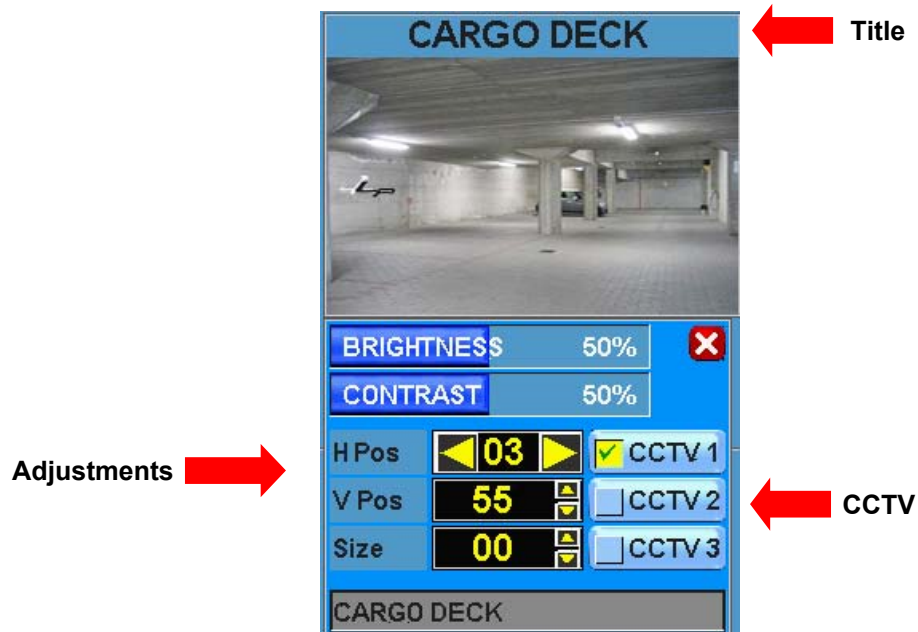


Figure 2.5.10.4 Task CCTV

Rescaling and moving the CCTV window is only possible using the Spin Buttons, which then make it possible to adjust the position vertically, using the “H position” arrows and then to adjust the horizontal position, using the “V position” arrows.

For the other adjustment functions, such as picture size, use the “Size” arrows. When adjusting brightness and contrast, change the percentages by using the Progress Bars. To close the adjustment window, click the arrow on the top right corner of the box. In this configuration, it is possible to use up to three CCTVs, each one with the previously entered settings. These operations are possible by selecting one of the CCTV windows (such as e.g. CCTV1 in figure 2.5.10.4).

It is also possible to rename the CCTV source, pressing the central trackball button on the lower label and entering the name via the keyboard window.

2.5.11 Additional PPI

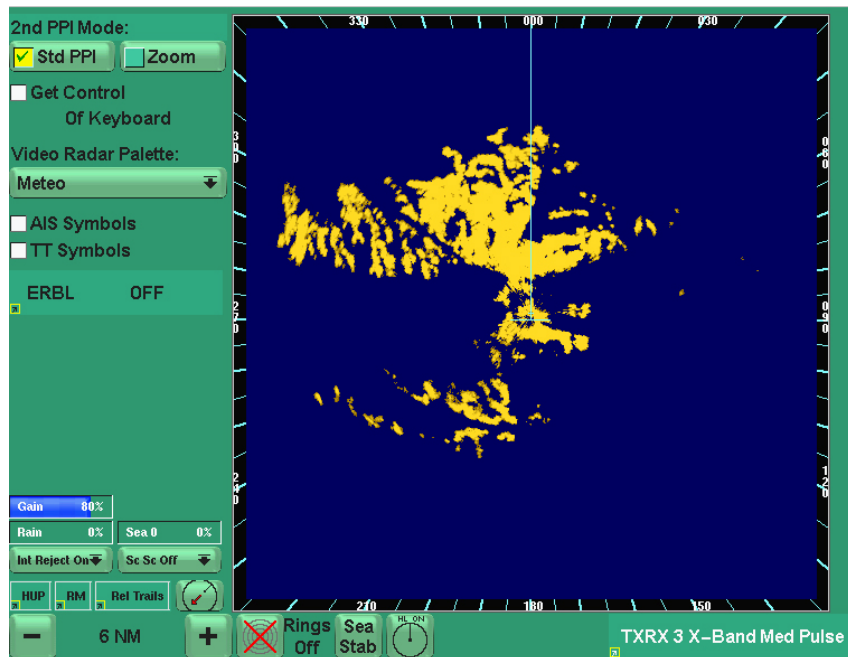


Figure 2.5.10.5 2nd PPI Mode

This type of representation is only available in wide screen mode and it offers the possibility to view a different type of presentation. Almost like having two radars. The Additional PPI can show different RADAR scales, orientations and stabilization. The additional PPI has separate Video processing and controls to have optimum conditions for specific use. It is also possible to present AIS and Tracked Targets.

From the Conning Tasks configuration list, select the “Additional PPI” configuration, which will open a screen like the one shown in figure 2.5.10.5, where the functions appearing are for the most part, the same as available for the first PPI .

WARNING

This function is only available when AREA 2 does not already contain the previously inserted tasks.

To enable direct keyboard control of the presentation functions in this mode, it is necessary to select the “Get Control of Keyboard” function. To present the AIS symbols on the 2nd PPI, select the window “AIS Symbol”. If you wish to see the Tracked Target Symbol, select “TT Symbols”. For more information about the symbols used, see paragraph 2.5.1.19. Different from the main PPI targets on the second PPI can be observed, but cannot be acquired, selected or deleted.

To enable the ERBL and VRM function (see explanation in para. 4.1.3), it is necessary to click with the arrow inside the dedicated shortcut. The measuring functions are the same as those applied for the first PPI.

ARGUS RADAR

General operation

2.5.11.1 Video Radar palette

Pressing the button indicating the Video Radar Palette, a list will open with the following options:

1. Video Radar: Yellow
2. Video Radar: Green
3. Video Radar: White
4. Video Radar: Meteo
5. Video Radar: Multi

Choosing one of the above options of the list, the colors of the Video Radar will change consequently .

2.5.11.2 Zoom

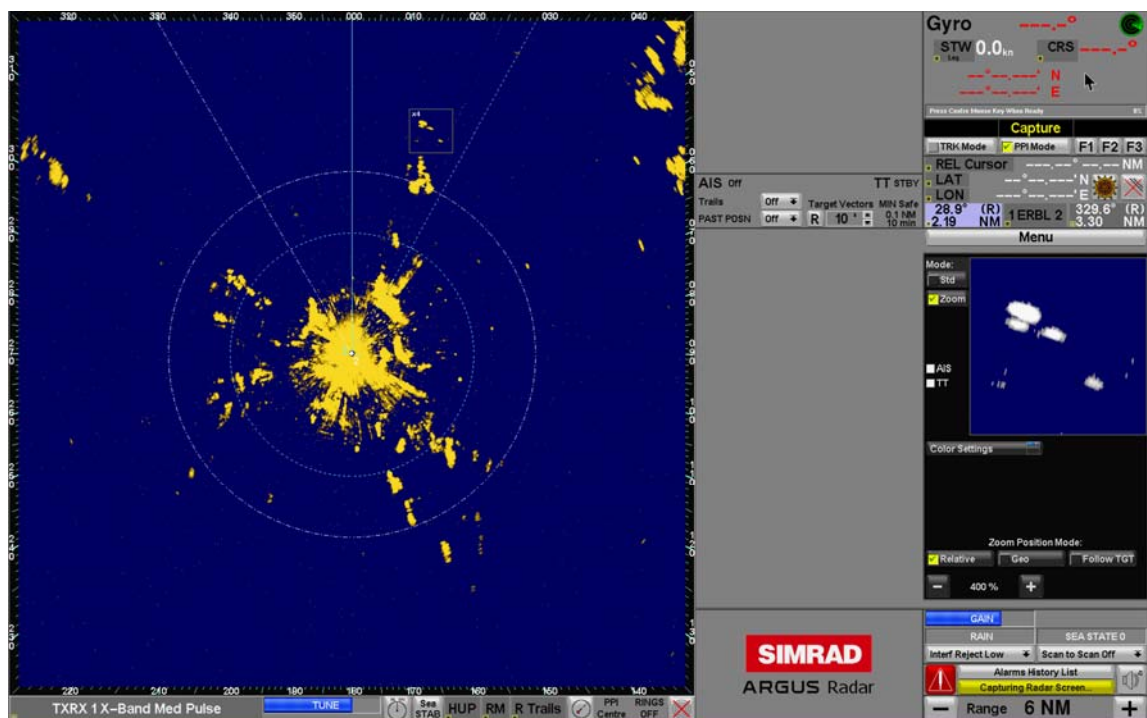


Figure 2.5.10.6 Zoom

To access this option, enable the “Zoom” checkbox.

A fixed size zoom window will be shown in the menu area. In zoom mode, a square will be drawn on the PPI indicating the area which is zoomed.

Use the center trackball key to move the area, right key to increase the zoom and left key to decrease it.

The zoom area has fixed dimensions, so an increase/decrease operation will resize the PPI selection accordingly.

In zoom mode, it is possible to enlarge the selected area in the first PPI by up to a maximum of eight times. See figure 2.5.10.6 .

Once the function has been enabled, it is possible to interact through one of three options:

- Relative** This means the possibility to follow your course throughout the route, viewing the surrounding area in detail.
- Geo** This means the possibility to focus the image in the geographic position for the area you intend to monitor only.
- Follow Tgt** This means the possibility to focus the image on a moving target, following it along its route.

CHAPTER 3

RADAR PRESENTATION AND VIDEO PROCESSING

3.1 PRESENTATION AND VISUALIZATION OPTIONS SECTION

In the lower section of the System Data Area the visualized buttons represent different functions and operations related to the presentation options (Figure 3.1.1).



Figure 3.1.1 Presentation and Visualization Options Area

3.2 ORIENTATION AND MOTION MODES

The function of this line (Figure 2.3.2 and Figure 2.5.1.4), normally labelled with the actual orientation and motion mode status, i.e. “HUP RM RT”, is to select the Orientation and Motion mode of the PPI. Pressing the button, the “Orientation and Motion Mode Menu” will be visualised. Operating within this menu, the operator can choose between the selections shown in Figure 3.1.1, where:

- “NUP” stands for North, “HUP” for Head and “CUP” for Course.
- “RM” stands for Relative Motion and “TM” for True Motion;
- “R Trails” stands for Relative Trails and “T Trails” for True Trails;

The Reset Course button is enabled only if a Course Up is selected. Its function is to reset the presentation to the actual Course Up, for example during a manoeuvre.

The function of the Auto Presentation Reset Check button is to enable / disable the Auto Presentation Reset after every Range Scale change.

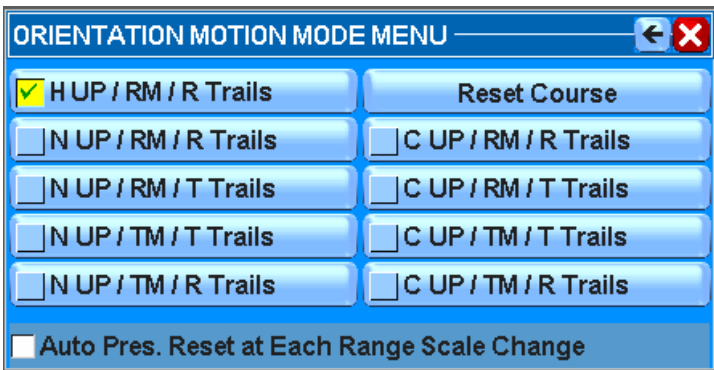


Figure 3.2 Orientation and Motion Mode Menu Window

For a deeper description of the available presentation Modes:

3.2.2 Head Up

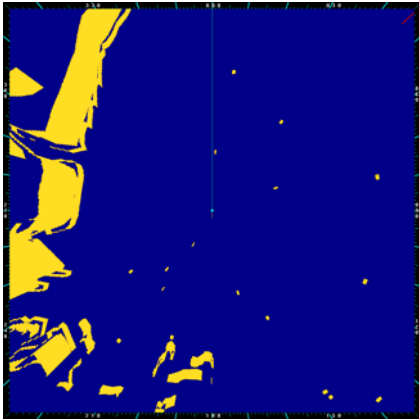


Figure 3.2.2

Operating in Head Up mode, the Heading Line on the PPI is oriented on the 0° of the Bearing Scale, and the Radar image is displayed relatively, when Own Ship turns, the Radar image rotates. A short red marker on the bearing scale represents the north marker, indicating the actual Own Ship Heading related to the North. The target echo is displayed at its measured distance and in its direction relative to own ship's heading. This is the only orientation Mode available if the Radar is not connected to a heading source. The Head Up mode is available only in Relative Motion mode. To choose True Motion mode or RM True Trails mode, the operator needs to select North Up or Course Up.

3.2.3 North Up

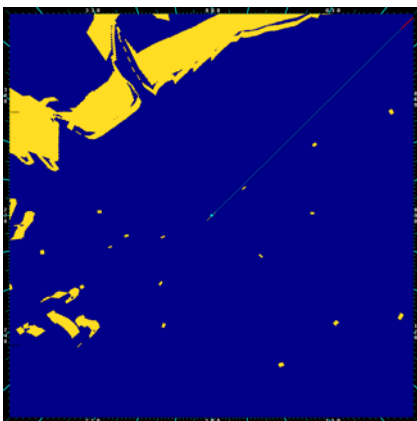


Figure 3.2.3

Operating in North Up mode, the Heading Line on the PPI is oriented according to Own Ship heading obtained from the Gyro compass, the 0° indication on the PPI represents North. When own ship turns, the heading line changes its direction according to the ship's heading and the Radar image remains stabilised in azimuth. The target echo is visualised at its measured distance and in the true compass direction from own ship. The North Up Orientation mode is not available if no heading source is connected to the Radar. If heading data is lost, the system will automatically switch to Head Up.

3.2.4 Course Up

When this mode is selected, Own Ship Course is oriented to 0°; when own ship turns, the system maintains the orientation of the picture rotating the Heading Line, to avoid whitening the sector between the initial and the terminal position. It is possible to be orientated to the new course by pressing the "Reset Course" button.

3.2.5 Relative Motion, (RM)

Own ship remains fixed on the PPI, and the Radar image moves around it with relative motion.

3.2.6 True Motion (TM)

Own ship position moves across the PPI according to own ship's Course and Speed, while the Radar image is displayed according to its true movement (land is steady and other ships are moving). If own ship position exceeds 50% off-centre on the PPI, its position is automatically reset to a point of 50% radius in the opposite direction. If heading data is lost, the presentation Mode is changed to Head-up Mode and the North Marker disappears.

3.2.7 P Reset / TM Reset

The function of the Presentation Reset button (Figure 3.2 and Figure 3.2.7-3.2.7.1) is to reset Own Ship position in the PPI. Depending if the system is operating in True or in Relative Motion, the button is labelled "TM Reset" or "P Reset". The function of the button is the same in both conditions: pressing the button, the PPI will be Off-centered and Own Ship symbol will be placed as far as possible from the point where it would disappear (opposite side respect to its course, at 50% of the Range Scale from the PPI centre), as shown in the following figures:

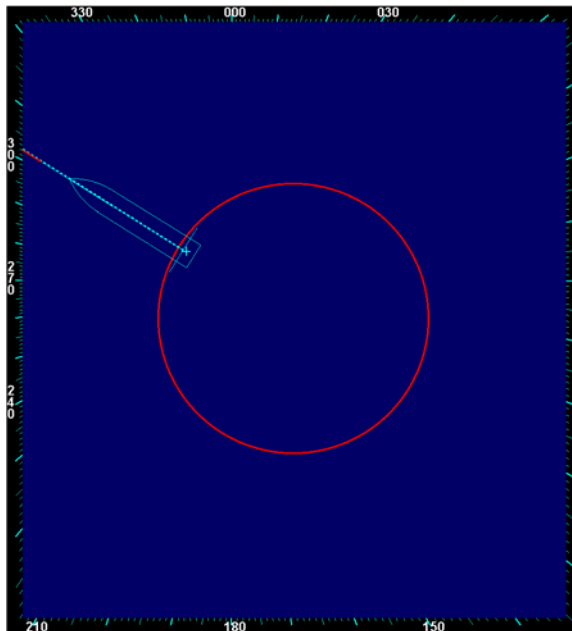


Figure 3.2.7
(Own Ship crossing the Off-centre limit of 50%)

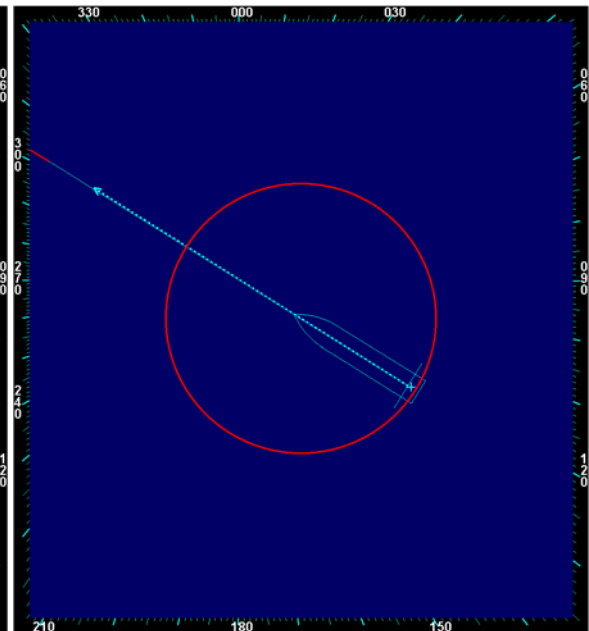


Figure 3.2.7.1
(Own Ship position after the TM reset)

This operation is therefore automatically performed by the system when, in True Motion, Own Ship passes 50% of the Range Scale from the PPI centre. In the above figures the 50% limit is represented by the red circle, NOTE that the red circle is not visible on the PPI, but has been drawn in the above figures to better explain how True Motion Reset works.

3.2.8 The Row under PPI Area

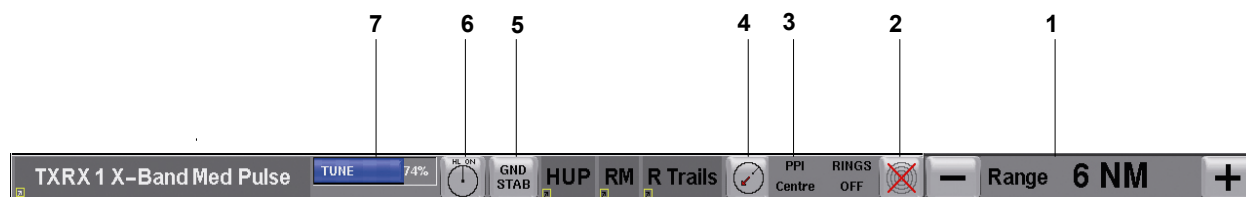


Figure 3.2.9

Under the Presentation and Visualization Options Area (Figure 3.2), the following buttons are located:

1. Range Scale Increase/Decrease
2. Range Rings ON/OFF
3. PPI Centre/Off Centre
4. P Reset/TM Reset
5. Sea Stab/Gnd Stab
6. Heading Line On/Off
7. Tune

3.2.8.1 Range Scale Increase/Decrease

The function of the two square buttons labelled with big “-” (minus) and “+” (plus) is to decrease or increase the Range Scale by one step. Between them, a label is indicating the actual Range Scale value in NM. There is a direct link between range scales and Transceiver PRF. Each time the range scale is changed, the optimal PRF is selected according to the following table:

Range Scale (NM)	Pulse Length (µs)	PRF(Hz)
0.25	0.07	3000
0.50	0.07	3000
0.75	0.07	3000
1.5	0.07	3000
3	0.07	3000
6	0.25	1500
12	0.25	1500
24	0.80	750
48	0.80	750
96	0.80	750

The PRF is controlled by the Range Scale setting of the master unit only.

3.2.8.2 Range Rings ON/OFF

Pressing the “Range Rings On/Off” button, the Range Rings will be visualised on the PPI. With the range rings the operator can approximately determine the distance to a target. The rings are equally spaced and the distance between the rings is written on the above mentioned button.

With reference to the bearing scale, the operator can approximately determine the bearing of the target from Own Ship position if the presentation is Head Up, and from the north if the presentation is North Up.

3.2.8.3 PPI Centre / Off centre

Next to the Range Rings button (Figure 3.2.9) is the PPI Centre / Offcentre label. The Radar picture is normally shown with own ship at the centre of the display and in this case the label indicates “PPI Centre”. However, the operator can move the centre, so that the ship is offset by up to 50% of the radius, anywhere on the screen and in this case the label indicates “PPI Offcentre”. The operator cannot offset the centre when the Radar display is set to the longest range scale (96 NM).

The centering of the PPI can be changed by means of the PPI section of the keyboard, or by selecting PPI Mode by means of the SKs. Once PPI Mode has been selected, placing the trackball cursor on the PPI, the Help Line will change to “Offcentre”, “Select” and “PPI Centre”.

Therefore, selecting Offcentre (pressing the left SK with the pointer in the PPI), the Radar picture will change the centre and the label will display “PPI Off Cent”; and vice versa, when the Radar picture is Offcentre, and the operator wants to place own ship back in the centre, he must press the right SK, in order to perform the PPI Centre function, reading on the label “PPI Centre”.

When in True Motion mode, the PPI CENTRE push-button is disabled and the Off Centre mode is automatically selected.

3.2.8.4 P Reset/TM Reset

The function of Presentation Reset button is to reset own ship position in the PPI, see para.3.2.7

3.2.8.5 Gnd Stab / Sea Stab

Choose between Sea and Ground stabilization, by pressing the “Log Water Speed” (or “Log Ground Speed” labelled button. Selecting Ground stabilization next to the speed value “SOG” will be indicated, instead of “STW” for Water stabilization. If there is no speed data, SOG or STW, available, the messages described in table 7.3.3 will appear in the wrong operation messages.

3.2.8.6 Heading Line and PPI graphics On / Off

Pressing this button (Figure 3.2.9) will hide the Heading Line and all the synthetic graphics on the PPI (range rings, maps etc.). The button is mono-stable, so releasing it, the PPI graphic is visualized again; therefore, the button must be kept pressed to keep the PPI graphic invisible.

3.2.8.7 Tune

The function of this control is to tune the Radar receiver to have maximum target returns on the screen. In the system, two modes of tuning are available: Manual Tuning and Automatic Tuning.

3.2.8.7.1 Automatic Tuning

Placing the Trackball pointer on the Tune progress bar, the Help Line will change accordingly, (see para. 3.3). If the tuning adjustment mode is not already automatic, pushing the centre SK, the tuning is switched to automatic and "TUNE" will be preceded by "A – ". In automatic tuning, at every range scale changing, the Transceiver performs a tuning of the receiver itself. Should the auto tuning fail for some reason, the message "Manual Tuning Required" is displayed, and after a few seconds it will automatically switch to manual tuning.

To switch from automatic to manual tuning, repeat the above procedure, pressing again the centre SK in the progress bar (the Help Line will indicate "Manual" in the centre SK).

3.2.8.7.2 Manual Tuning

The Tuning progress bar indicates the tuning level of the receiver, measuring the received signal. The adjustment is performed placing the Trackball cursor over the Tune progress bar, the Help Line will change accordingly. To increase the Tuning voltage, the right SK must be pressed. To decrease it instead, the left one is used. During the adjustment, the value is indicated by a small, down-oriented red arrow, which when between 48 and 52 % the color is changed to yellow (see following pictures).



It is better to perform the manual tuning only in case of failure of the automatic tuning. The adjustment should be performed about 10 minutes after the Radar has been switched on and once the magnetron has warmed up properly.

To better tune the Radar manually, the operator should set the Range to 24 NM and set the Gain in order to show the threshold of noise. This is the best condition to tune the Radar: with high enough level of gain and long pulse transmitting. In this condition, adjust the tuning control to obtain the maximum signal strength. The manual tuning is possible with medium pulse too, but better to not perform it with short pulse.

3.3 VIDEO PROCESSING SECTION

In this Section of the System Data Area Monitor, the set of video processing is visualised (fig. 2.3.2). The following picture shows details about the possible controls.

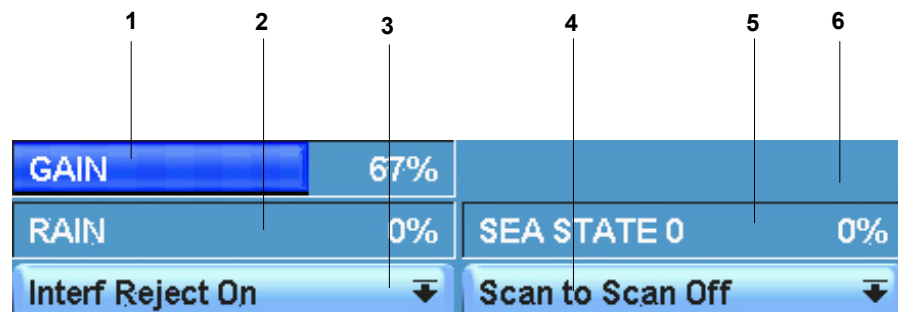


Figure 3.3.1 Video Processing Section – Detail

1. Gain
2. Anti Rain
3. Sweep to Sweep correlation
4. Scan to scan Correlation
5. Sea State
6. Auto Sea/Rain (Available only in advanced video processing)

Placing the Trackball pointer on each of the video processing progress bars, the help line changes accordingly and the cursor changes to a thin double horizontal arrow “Manual Adjust mode” or “Automatic Adjust mode” .

3.3.1 Gain

The Gain progress bar shows the gain level adjusted by the operator, by means of the SKs used, placing the trackball cursor inside it; its function is to control the strength of the target returns. The Gain adjustment is performed placing the cursor over the Gain progress bar and looking at the Help Line, which will change.

By default, at the start-up of the system, the gain assumes the standard value of 80% (normally the progress bars don't show the percentage) in order to receive the optimal noise level. The Gain adjustment is a very important operation. The gain Control adjusts the sensitivity of the Radar receiver. The proper setting is such that the background noise is just visible on the screen. Setting up for too little gain, weak echoes may be missed. On the other hand, with an excessive gain yields too much background noise; targets may be missed because of the poor contrast between desired echoes and the background noise on the display.

WARNING

The Gain control shall not be used to clean the picture from sea clutter noise. The use of the Gain control to clean the picture could compromise the proper working of the Radar tracking facilities.

As the SEA control affects the Gain, it will be necessary to manually re-adjust it, if the Gain setting is manually changed.

3.3.2 Video Level Equalization

When the operator changes the range scale from e.g. 6 NM to 3 NM or less, the system makes an equalization of these levels. The time necessary to visualize this equalization, coming from 6 NM range scale, is a few seconds. This kind of processing allows to get the maximum contrast of the echoes, depending of the video level.

3.3.3 Rain

The Rain progress bar indicates the intervention of the Anti Rain Clutter processing. In case of automatic Anti Rain Clutter processing, the inscription "A –" will precede "RAIN" inside the progress bar.

Marine Radars are sensitive to rain drops, snow flakes and fog, the returning signal is something similar to a big hazy spot of video, which can saturate the receiver and mask all targets covered by the humidity.

The purpose of the Rain control is to reduce this kind of clutter, so that targets masked by the clutter can be seen and distinguished on the Radar picture.

To obtain good results, the rain echoe spots must be weaker than the real echoes, otherwise the Rain control cannot distinguish their shapes and they cannot be drawn on the screen.

The operator should turn the control down, even to zero, when its use is not required (i.e. sunny condition). Since storm cells are usually visible at long distances due to their extreme altitude, the operator may wish to leave them displayed so that it is possible to observe the location of bad weather.

In order to reduce the effects of Rain drops, place the Trackball cursor over the Rain progress bar, the Hep Line will change accordingly. To increase the Rain control, the right SK must be pressed, and the left one used to decrease it.

Inside the Rain progress bar, the function of the Centre SK is to switch between Manual and Automatic Rain Clutter control, according to the suggestion of the Help Line.

3.3.3.1 Manual and Auto-rain

Rain clutter shows as an echo that has almost constant intensity across the area seen on the PPI. It can mask all target echoes that have same or less intensity.

The gain processing will try to equalize the detected video, so usually this means that higher amplitude target over rain are presented with the same brilliance on the screen and they are not recognizable.

The only way to discriminate between target echoes and rain clutter is not to look at signal amplitude,

but at their rate of change in range.

That is exactly what the Manual RAIN control is doing, it works as an FTC (fast time constant) filter whose output shows only echoes that are well defined in range.

The main drawback is that for the same reason, land echoes are also filtered and target size in range is drastically altered and only the leading edge is visible.

The rain clutter residuals can be suppressed by adjusting the gain control, but it is also possible that small false echoes are presented as result of RAIN processing. Usually scan to scan correlation is the best choice to clean up the PPI from these clutter residuals.

The manual RAIN control should be adjusted in function of the TXRX pulse length that is depending of the range scale selected on Argus Radar displays.

Higher RAIN control is necessary for shorter pulses.

Long/medium pulses should not be used under medium/heavy rain conditions, the signal received will be high in the rain area and will mask all target echoes in between, and will attenuate the transmitted signal, so echoes farther than the rain clutter area will be very dim or completely invisible.

The auto RAIN control takes care of different pulse lengths and is also able to show the leading edge of land returns. This control implements a CFAR (Constant False Alarm Ratio) filter and it is the optimum choice in almost every weather condition.

As for the manual RAIN, clutter residuals are suppressed with the gain control and scan to scan correlation.

3.3.3.2 Loss of detection caused by rain clutter.

Radar performance is measured for two rates of rain, 4 mm/h (moderate rain) and 16 mm/h (heavy rain) and it considers the losses caused by the attenuation of the transmitted pulse.

Long pulses should not be used in heavy rain as the range will decrease significantly.

Maximum range detection of target is slightly affected with moderate rain and short pulse, but becomes only 30% with heavy rain.

On long pulses the range decreases to unacceptable 30% with moderate rain to 10% with heavy rain. So this underlines that long pulse should never be used on X-Band in rain conditions.

3.3.4 **Sea**

The function of this control is to reduce sea returned signals. The sea waves return to the Radar a spot similar to the one of rain, but with a different behaviour. The spot drawn on the screen is normally around the PPI origin and its intensity decreases with increasing range. The function of the Sea control is to cut the video detected under the Anti Sea Clutter curve, its effect is stronger close to the origin (antenna) and weaker going farther in range, following the Sea clutter behaviour.

Sea clutter is composed of a very large number of echoes, originated by the random wave reflections from scan to scan. The clutter from these reflections will make it difficult to detect real targets. Such sea clutter usually appears as multiple echoes on the display at short range scales, and the echoes are not repetitive or consistent in position. Since the sea condition depends on the wind, it is not always easy to determine the most important factor affecting the sea Radar echo. Generally at a higher frequency (3 cm), wind is a significant Parameter to which sea echo can be compared. If the sea is calm and not disturbed by wind, sea echoes are very small, but targets even as small as seagulls can easily be seen on the PPI.

Due to the electrical characteristics, the Sea clutter and land clutter reflections are comparable. The surface of large waves is sometimes bigger than the surface of a boat or small ship, in that case there is no way to discriminate between the two echoes. The only option is to apply scan to scan correlation with the highest setting (3), but only if the target dimension and speed follow the table (see table 3.3.1 Scan to Scan correlation).

Reflections from sea waves and targets are “competing” among themselves, so also automatic processing like auto anti-sea/rain clutter tend to make targets intensity lower and size smaller than the real values. Sometimes sea waves are presented in a coherent and stable way on the PPI and it is possible to recognize the linear shape of the wave front.

It is very hard for any automatic Radar video processor to discern this type of wave from a target echo. They have almost the same amplitude, they have a shape that is consistent with time. The operator can increase the gain threshold, but sometimes has to accept that a clear scan is almost impossible without cancelling interesting echoes

The sea clutter can be suppressed with the manual SEA control. This one reduces the signal received following an attenuation curve that is calculated at the installation, according to the antenna height transceiver and antenna types and especially the sea state selection.

The attenuation curve changes considerably from sea state 1 to sea state 4, after this last one the difference between the sea state selections becomes less important.

The clutter residuals are then reduced acting on the manual SEA bar. The main drawback of manual SEA processing is that it acts in the same way for the entire scan.

When the sea clutter return varies heavily with the bearing angle, because wind condition are different, or when the ship enters in closed areas protected from winds by land, the manual SEA control will be optimized only for the highest sea clutter direction.

Target echoes in lower sea clutter directions, will be dimmed unnecessary. In these conditions it is preferable to use auto SEA clutter control. This processing evaluates the peaks of sea clutter around the ship and tries to follow the sea clutter signal envelope.

The biggest challenge is that sea clutter returns have a clear amplitude average, but around this value they are peaking a lot and sometimes it is possible to discern wave structures.

These peaks can be higher also from small target reflections but they change position in every PPI scan. Scan to scan correlation is useful for reducing them because real echoes can be found in

ARGUS RADAR

Radar presentation and video processing

almost the same place from scan to scan (see limitations in Table of Scan to Scan correlation Para.3.3.5).

Field experiences demonstrate that:

- As wind grows up and exceeds approximately 5 Knots, sea echoes quickly increase from the previous small value.
- The amplitude of the sea clutter decreases with increasing range from the PPI centre.

Sea return is especially bothersome in heavy seas, since buoys or other small objects are producing echoes of a level lower than the waves and cannot be detected even by means of the Auto-adaptive Anti Sea Clutter function. The knowledge of approximate position of buoys or light ships is of considerable assistance, as it is then possible to use the Manual Anti Sea Clutter and to concentrate on the appropriate section of the Radar screen. Land masses should be clearly visible despite of heavy sea conditions.

Care should be exercised using the Anti Clutter Control. If the control is set too low, targets remain under the clutter, while if the set is too high, both sea clutter and targets will disappear from the display. In case of a too strong suppression of clutter, the dark area displayed around own ship may not show potentially dangerous nearby targets. The proper setting of the Sea Clutter should be such that the clutter is seen as small dots, and small targets will become distinguishable around the ship.

The Sea control reduces the gain level in the areas near your vessel, extending up to 3-5 NM depending on the wave and sea conditions. This is the main reason why the use of the Gain control to reduce sea clutter effect is not correct. The Gain control produces the same effect at all ranges, causing for example loss of targets at 5 NM, when wishing to remove clutter at 1 NM.

In order to reduce the Sea Clutter effects, the operator has to place the Trackball cursor over the "SEA" labelled progress bar. Use the SKs in order to increase, decrease or switch the Anti Sea Clutter control to Automatic mode.

The Help Line changes when the list is closed, when the list is opened and in automatic STC mode.

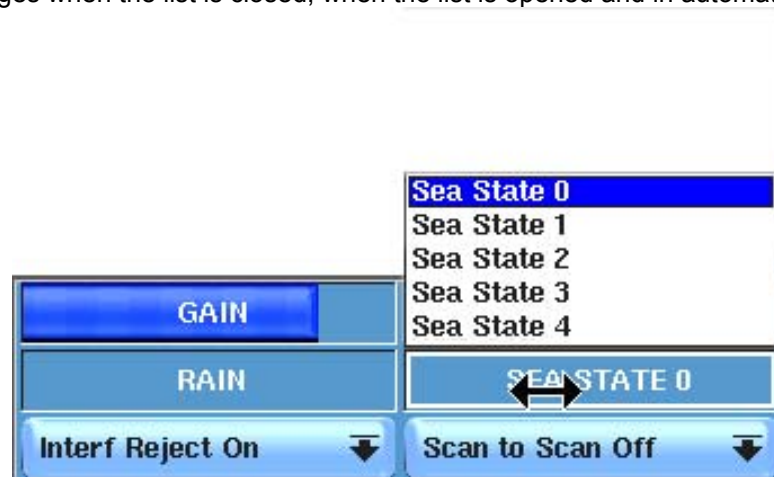


Figure 3.3.4 Sea state

The sea clutter attenuation curve depends on the antenna size and height, and especially the sea state. The list permits selecting the optimal curve for every sea state.

The Sea progress bar will indicate the Sea State selected, as shown in the previous left figure (Sea 5). Placing the mouse pointer over the Sea progress bar and pressing the centre SK, the list shown in the previous right figure will appear, giving the possibility to select a different sea state or the Auto Adaptive Sea Control. Selecting one of the possible items, the indication in the progress bar will change consequently and the Sea Shape correspondent to Sea State selected will be loaded by the system.

After the sea state has been selected, the clutter residuals reduction can be optimized operating on the sea clutter bar. Increasing the bar, reduces the sea clutter, decreasing works in the opposite way.

NOTE

The sea state STC curves should have been created for each transceiver by instructed service personnel. For more details regarding how to build the sea state STC curves, refer to the Argus Radar - Installation and Service Manual.

When rain and clutter is present at the same time as sea clutter, both detection losses are operating at the same time. Sea clutter is always a short range problem, depending of the sea waves' height, so when a precipitation bank is distinct from the sea clutter reflection, the picture will experience detection losses in the precipitation bank and farther in range (on the angle covered by the rain clutter) and the usual losses in the sea clutter area.

The worst situation is when the precipitation is over the ship position and the detection losses caused by the two different types of clutter affect the presentation in such a way that it is hard to discern near echoes in the clutter and farther because attenuated by the rain absorption.

The best strategy is to avoid using long pulse transmission, depending from the rainfall rate. The X-Band will be useful only for near range detection, using only the short pulse.

WARNING

WHILE ADJUSTING GAIN, TUNE, SEA OR RAIN, VERIFY THAT TRAIL MODE IS NOT IN USE.

NOTE

The sea and rain clutter do not affect the AIS Target.

3.3.5 Advanced video processing

If advanced video processing is available, a new push-button named "Auto Sea/Rain" is available.

Advanced video processing is indicated when the weather conditions are changing constantly, e.g. when the sea state changes frequently during navigation, the ship is moving inside a rain area or when the sea clutter pattern is very asymmetrical.

The advanced video processing tries to optimize the suppression of clutter, removing sea and rain clutter and leaving land masses and target echoes visible.

This video processing is activated by pressing the "Auto Sea/Rain off" push-button. Besides changing the button label to "Auto Sea/Rain on", other controls will change their function.

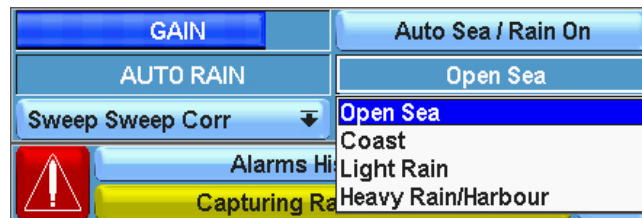


Figure 3.3.5 Functions "Auto Sea/Rain on"

The RAIN progress bar changes to AUTO RAIN and the sea state progress bar becomes a list, which is useful to select the best clutter suppression strategy according to the situation.

Options available are:

Open Sea

No land masses are visible. Sweep to sweep correlation is automatically selected to improve filtering of sea clutter residuals.

Coast

Rain and Sea clutter are suppressed, coastline and land masses are shown.

Heavy Rain

Select this option when the ship is situated inside a combined rain/sea clutter area and it is not possible to define a clear demarcation between them. Use Gain progress bar to clear clutter residuals.

Light Rain/Harbour

Select this option when the ship is navigating in narrow waters or it is moving in a small harbour. Useful also when the ship is situated in light rain precipitation.

Generally speaking, with advanced video processing enabled, the gain progress bar is not operating. The only exception is with Heavy Rain selection.

The clutter suppression strategy is available as a list box on a progress bar.

Adjust the progress bar value to increase the clutter suppression effect.

3.3.6 Scan to Scan Correlation

The function of the Scan to Scan Correlation control is to distinguish real target echoes from sea clutter. Correlation is performed by storing and averaging echo signals over successive picture frames. If an echo is solid and stable, it is presented in its normal intensity. Sea clutter is averaged over successive scans resulting in reduced brilliance, making it easier to discriminate real targets from sea clutter.

Echo averaging uses scan to scan signal correlation technique based on the true motion over the ground of each target. Thus, small stationary targets such as buoys will be shown while suppressing random echoes such as sea clutter. True echo average is however not effective for picking up small targets running at high speeds over ground or, as well, small target at low scale, when the Radar echo covers great areas in very short times. For this reason the operator has to pay extra attention to fast moving targets.

Pressing the Scan to Scan button, a list with the selectable number of scans will be opened. The system will perform the above mentioned correlations within the set number of scans, to distinguish the real echoes from the false.

Scan to scan correlation is a process that filters the radar echoes that are not present in the same position for N consecutive scans. N is a number comprised between 3 and 4.

This means that an echo that changes its position during the correlation time (depending also from antenna rotation rate) more than its dimension can be cancelled from the PPI.

The table below is useful to estimate which echoes will be stable on the PPI according to their maximum speed.

For example, if the antenna rotates at 20 rpm and the operator selects Scan to Scan 2/3, a radar echo smaller than 30 m with a speed of 20 knots, will move too fast and therefore will not be visible.

The same echo having for example maximum dimension of 25 m will be correctly displayed if the antenna rotates at 40 rpm (HSC), as the minimum dimension indicated in the table is 16 m.

The highlighted sections in the table indicates cases where the Scan to Scan correlation should not be used, as it will require unrealistic ship sizes in order to be visible.

V (KN)	20rpm 2/3	40rpm 2/3	20rpm 3/4	40rpm 3/4
10	16 m	8 m	30 m	16 m
20	30 m	16 m	60 m	30 m
40	60 m	30 m	120 m	60 m
70	120 m	60 m	240 m	120 m

Table 3.3.1 Scan to Scan correlation

3.3.7 Interference Rejection

The function of the Interference Rejection is to eliminate the mutual Radar interference and second trace echoes. Pressing the IR button, placed under the Rain progress bar (Figure 3.3.4), will open a list with four possibilities:

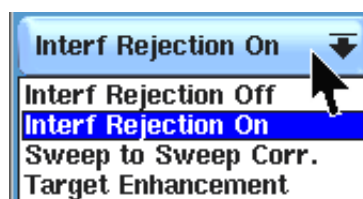


Figure 3.3.7 List of interference Rejection

ARGUS RADAR

Radar presentation and video processing

- Interference Rejection Off
- Interference Rejection On
- Sweep to Sweep Correlation
- Target Enhancement

Depending on the choice, the Radar picture of the same environment will change as shown in the following four figures:

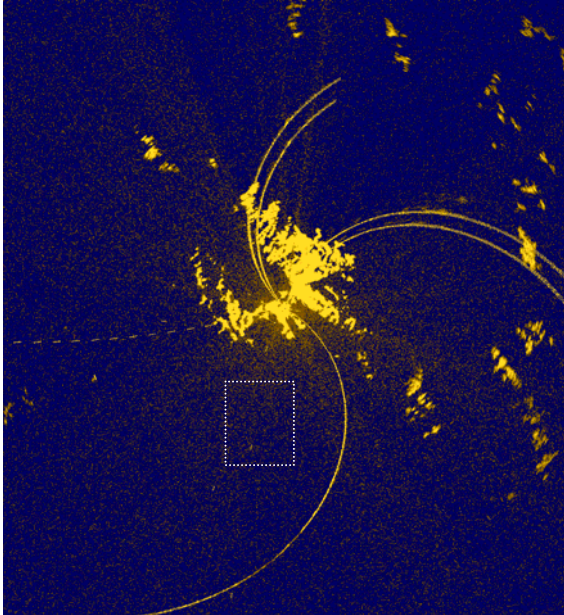


Figure 3.3.7.1 IR Off

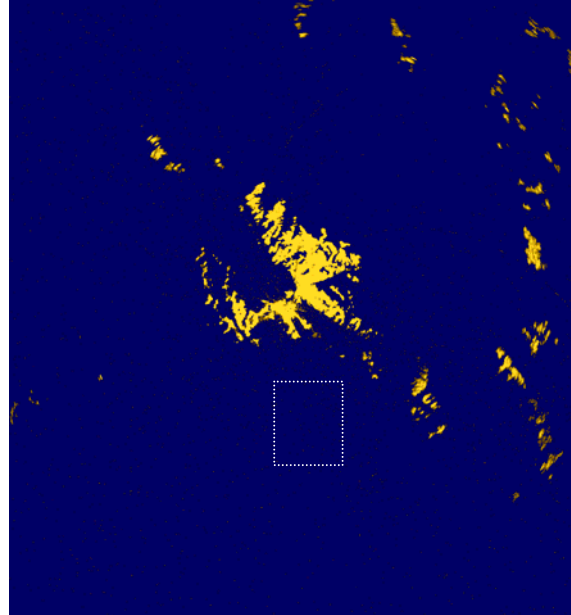


Figure 3.3.7.2 IR On

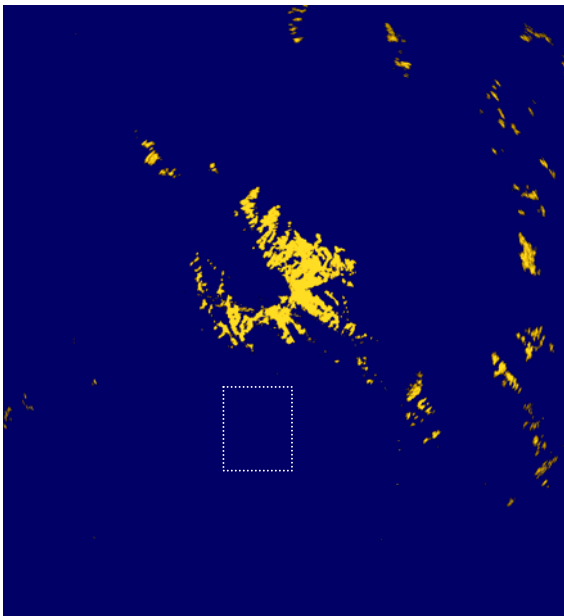


Figure 3.3.7.3 Sweep to Sweep Corr.

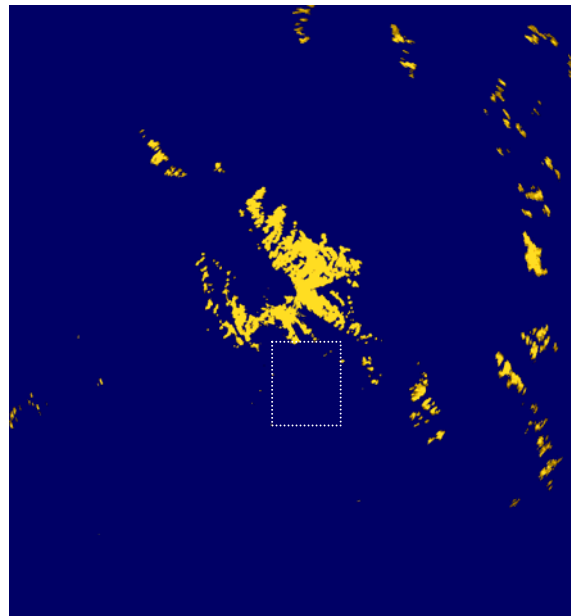
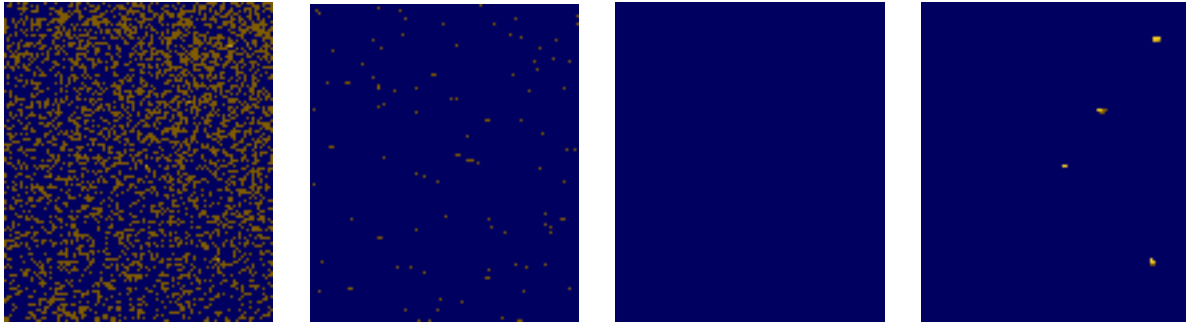


Figure 3.3.7.4 Target Enhancement



The above figures show zooms of the areas delimited by the white rectangles drawn in the previous four figures, in a part of the Radar image in which some small and weak echoes are on the limit to be visible with IR off, definitely not visible with IR On and with Sweep to Sweep Correlation and very visible with Target Enhancement. This demonstrates that the type of IR must be chosen according to the environment around own ship: IR off when the maximum signal from the receiver is needed, IR on when the interference disturbs the visualisation and consequently the RADAR TARGET also (the situation shown by the above pictures, and the usual one), Sweep to Sweep when strong interference are not sufficient cleaned by the IR and Target Enhancement when necessary to distinguish between weak real echoes and interference or clutter with a small difference of amplitude between each other.

Transceiver pulse staggering is always enabled, except when IR is off. When enabled, the transceiver PRF is changed alternatively for each sweep. Under this condition, spiral interferences and second trace echoes are splitted in range from sweep to sweep. Then, IR processing clears all the echoes found at the same range that are not present in each sweep.

3.3.8 Mutual Radar Interference

Interference from other Radar must be expected when two, or more, Radar-equipped ships are operating within the range of each other. The interference appears on the screen in the form of spirals or dashed lines starting from the PPI origin. This interference is cut by means of a digital Interference Suppressor Circuit included in the Video processor System.

3.3.9 Second Trace Echo

Second trace echoes are present only in condition of super-refraction. In these situations, echoes placed at big distances may be displayed on the screen as second traces echoes. This happens when the return echo is received one transmission cycle later, after the next Radar pulse has been transmitted. They can be recognised because of their irregular shape. A Radar set, with a pulse repetition rate of 800 cps, presents second time around echoes whenever a signal is received from a target at more than 97 NM. Due to the fact that the period between two subsequent transmitted pulses is subject to small variations the second trace echo appears undefined and hazy. These echoes will be displayed at their correct bearing but at a wrong range given by their actual distance minus 97 NM.

Usually second Trace Echoes are automatically suppressed by the radar, when interference rejection is different from OFF a PRF jitter is enabled and the second trace echo is shown at different ranges from sweep to sweep. In this way the echo is not always present at the same range so it is recognized as an interference and then suppressed by the IR process.

3.3.10 Sweep to Sweep Correlation

Sweep to Sweep Correlation is a video process that prioritizes echoes appearing from scan to scan. If an echo is only present in a single scan it will not be visible on the screen. Small echoes surrounded by clutter may not be presented.

3.3.11 Target Enhancement

Target Enhancement video processing is used to enhance the visibility of radar echoes. By stretching them in azimuth and in range and increasing their brightness. The range stretching is made only for the small echoes and not for the landmasses or rain blocks of video.

Target enhancement works after the anti-sea/rain processing, and with an additional sweep to sweep control to filter the noise and sea/rain clutter residuals. This is made so that only the smaller echoes are enhanced in dimension and brilliance. The size enhancement action is more visible on lower range scales.

3.4 SART (SEARCH AND RESCUE TRANSPONDERS) VIDEO PRESENTATION

The SART (**S**earch **A**nd **R**escue **T**ransponder) is used for emergencies. The range for detection of a SART is normally about 8 NM and its signal may be triggered by any X-Band Radar. Its purpose is to locate distressed vessels by displaying a series of echoes on the X-Band Radar display of a hypothetical rescue ship. Upon receiving a pulse from a standard 9 GHz X-band Radar, the SART immediately transmits a response, which is swept repetitively across the complete Radar frequency band. The response is made by a first rapid sweep (0.4 μ s) through the band and a relatively slow sweep (7.5 μ s) through the band back to the starting frequency, repeated for a total of twelve complete cycles. At some point in each sweep, the SART frequency will match the one of the interrogating Radar and, being within the pass band of the Radar receiver, the signal will be displayed on the Radar as a line of 12 dots equally spaced by about 0.64 nautical miles.

When the range to the SART is down to about 1 NM the Radar display may show also the 12 responses generated during the fast sweeps. These additional dot responses, which also are equally spaced by 0.64 NM will be interspersed with the original line of 12 dots. They will appear slightly weaker and smaller than the original dots.

To best detect a SART signal, proceed as follows:

- Use a range scale between 6 and 24 NM, due to the spacing between responses to small to be distinguished at higher scales (0.64 NM).
- Set Sea control to minimum in manual.
- Set Rain in manual and use it normally.
- Set Gain control to see some noise dots in background.
- Turn Off Scan to Scan Correlation.
- Turn Off Echo Stretch.

Range Scale:

The reason why, when looking for a SART it is preferable to use from 6 to 24 NM range scale, is because the length of the SART response of 12 dots may be extended to 9.5 NM beyond the position of the SART and it is necessary to see more than one response dot to distinguish the SART from other responses.

Sea Control:

This control shall be set to minimum for optimum SART detection, as the control could cut the sea clutter as well as the SART response. Note that in this condition (Sea control at the minimum) ships inside the clutter range may not be visible to the Radar. Note also that in case of strong clutter the first few dots of the SART response may not be detectable, due to the sea control at the minimum. In this case, the position of the SART may be estimated by using the ERBL off centre function and measuring 9.5 nautical miles from the farthest dot back towards own ship.

Rain Control:

The SART response is not affected by the action of the rain clutter control, so the control shall be used normally to detect ships in rainy areas, but it shall not be used in automatic.

Gain Control:

For maximum range of SART detection the normal gain setting for long range detection should be used and a few dots of noise shall be visible in the background (around 80% of the gain bar).

Scan to Scan Correlation:

The SART response could be weakened by this control and this is why it should be turned off.

Echo Stretch:

The shape and dimension of the dots of the SART response could be modified by this control and therefor it should be turned off.

Furthermore:

When only the responses generated by the slow sweeps are visible (when the SART is at a range greater than about 1 NM), the position of the SART must be estimated 0.64 NM closer than first dot. Whereas, when the distance from the SART is short and the responses generated by the fast sweep are visible, the position of the first of these will be not more than 150 m beyond the true position of the SART. The Long Pulse should attenuate the SART response, for this reason, if using a range scale of 24 NM, it is recommended to proceed as follows:

- select the "Short Range Small Echoes" preset video processing.
- Set the Gain control at 80%.
- Set Sea Control at minimum.

This way the "Power Pull Down" function will be activated and the transceiver will use the medium pulse for the 24 NM range scale and the short pulse for the 6 and 12 NM range scale.

Getting closer to the SART and changing the range scale to under 6 NM it is recommended to return to the "Standard Video Proc".

As the SART is very near, side lobes from the Radar antenna may show the SART responses as a series concentric arcs or rings. This effect can be removed by using the sea control.

Anyway it could be operationally useful to observe the side lobes as they might be easier to detect in clutter conditions and also they will confirm that the SART is very near to own ship.

To improve the visibility of the SART in clutter conditions, the Radar may be detuned to reduce the clutter response without reducing the SART signal. To perform this operation, the tuning must be set

ARGUS RADAR

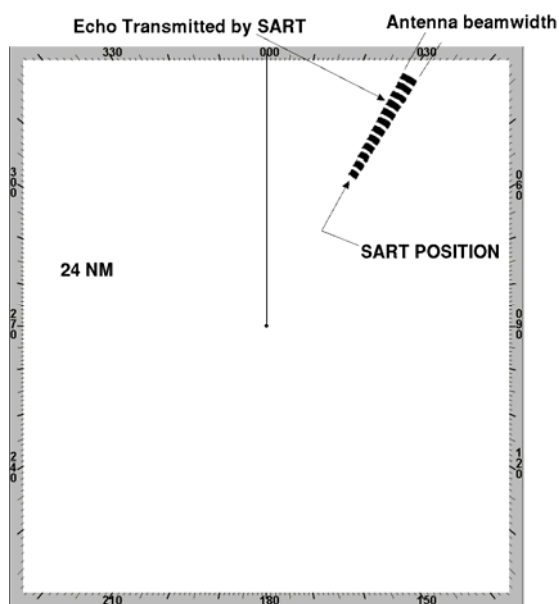
Radar presentation and video processing

to manual and the potentiometer moved to one side. The operator should take care when doing this, because the detuned Radar will not be able to see and track targets as it will when it is tuned. And the anti collision functions may no longer be working. The tuning should be returned to normal as soon as possible.

NOTE

SART can be revealed on X Band Radar only. Small echoes are displayed on SHORT pulse only.

Screen A: SART is far.



Screen B: SART is close.

The lines are displayed as concentric arcs:

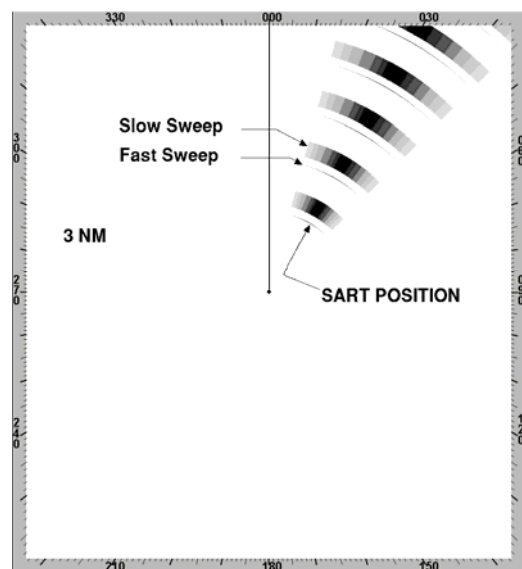


Figure 3.4 SART Signal on the Monitor

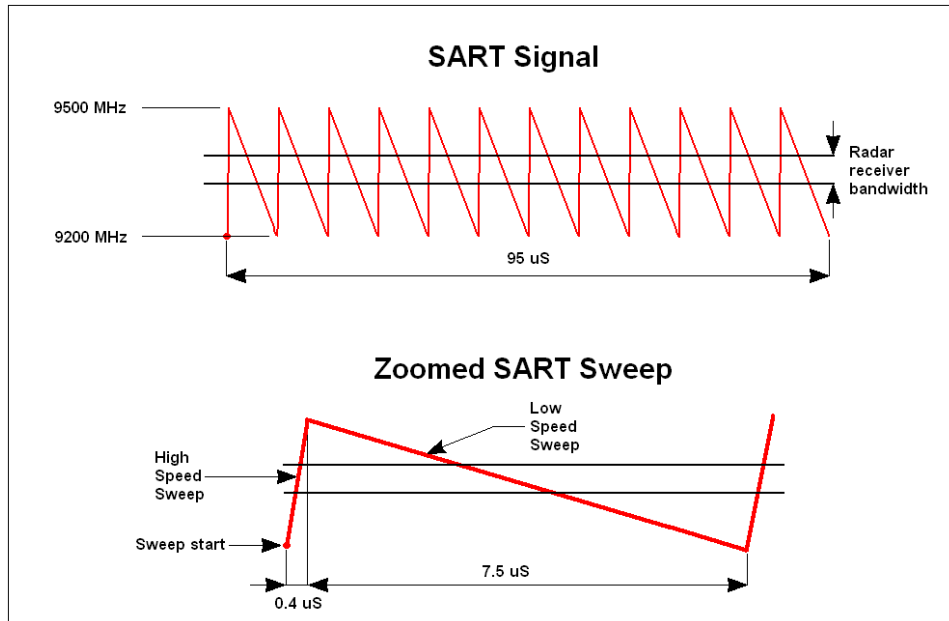


Figure 3.4.1 Particular of SART Sweeps

The information described in this paragraph has been extracted from IMO SN/Circ 197, OPERATION OF MARINE RADAR FOR SART DETECTION.

3.5 RACON (RADAR BEACON) VIDEO PRESENTATION

Racons, also called Radar Beacons, Radar Responders, or Radar Transponder beacons, are receiver/transmitter transponder devices used as a navigation aid, identifying landmarks or buoys on a marine Radar display. A Racon responds to a received Radar pulse by transmitting an identifiable mark back to the Radar set. The displayed response has a length on the Radar display corresponding to a few nautical miles, encoded as a Morse character beginning with a dash for identification. The inherent delay in the Racon causes the displayed response to appear behind the echo from the structure on which the Racon is mounted. Racons and their identifying marks are normally indicated on marine charts.

Racons purpose can change with the country it is placed in. Generally they are used for:

- identify aids to navigation, both seaborne (buoys) and land-based (lighthouses)
- identify landfall or positions on inconspicuous coastlines
- indicate navigable spans under bridges
- identify offshore oil platforms and similar structures
- identify and warn of environmentally-sensitive areas (such as coral reefs)

In some countries they are also used to:

- mark new and uncharted hazards (these should use the Morse identifier "D")
- identify centre and turning points
- leading line racons

Racon technical characteristics

Generally Racons are frequency agile, designed to measure the frequency of all incoming Radar pulses, and transmit an approximately 25 microsecond Morse-encoded response less than 700 nanoseconds later back to the Radar on that frequency. The Morse-encoded response is encoded such that the length of one dash is equal to the one of three dots, and the length of one dot equals that of one space. All Racons operate over the frequency range 9300-9500 MHz marine Radar band (X-band).

Racon range is approximately line-of-sight range, normally over 15 nautical miles, although actual range depends upon a number of factors, including mounting height, atmospheric conditions, and Racon receiver sensitivity setting.

Racons installed on buoys are normally active for 20 seconds, and then off for the next 20 seconds and so on. Racons installed on shore, where battery life is not a factor, are normally programmed to operate 75% of the time. Racons are usually not programmed with a duty cycle greater than 75%, in order to ensure that the response never completely masks an important Radar target.

The Racon response could be degraded by anti rain and sea clutter control and interference suppression. Consequently, shutting off of the above mentioned video processing should improve the Racon visibility on the PPI. The detection range of a Racon may also be reduced if the Radar receiver is not tuned. Scanning the Radar tuning control should correct that problem.

WARNING

The video processing Scan to Scan Correlation could suppress the Racon return on the display, and may need to be shut off. In order to disable it, refer to para. 3.3.6

3.6 Video Processing Menu

The system provides 6 kinds of pre-set video processing, which can be loaded by means of the button next to the tuning bar. Pressing the button, the "PRE-SET VIDEO PROC AND SETTING MENU" will be opened.



Figure 3.6 Pre-set video processing

The scope of the function is to provide shortcuts to adjust the Radar at the best for the 6 conditions, giving the possibility to perform any desired change to better adapt the setting to the real environmental condition. The yellow text under the selections is a suggestion provided to better understand the task of each setting. Each different selection will automatically change the caption of the button placed next to the tuning bar, according to choice made. In case one of the 6 settings is selected, the button will be indicated with yellow background, to indicate the setting also when the Menu has been closed.

The way to select none of the 6 settings is to select "Standard Video Proc". In this case, the button next to the tuning bar will appear as in Figure 3.6.

The following table specifies the settings of each selection:

HARBOUR	Gain Sea Rain Scan to Scan Interf. Rej. STC Curve Power	Auto Auto Manual 0% Off On Standard Normal
MEDIUM RANGE	Gain Sea Rain Scan to Scan Interf. Rej. STC Curve Power	Auto Manual 60% Manual 0% Off On Standard Normal
LONG RANGE	Gain Sea Rain Scan to Scan Interf. Rej. STC Curve Power	Auto Manual 75% Manual 0% Off Target Enhancement Standard Normal
SHORT RANGE / SMALL ECHOES	Gain Sea Rain Scan to Scan Interf. Rej. STC Curve Power	Auto Manual 50% Manual 0% 1 Scan Target Enhancement Standard Pull Down
BAD WEATHER	Gain Sea Rain Scan to Scan Interf. Rej. STC Curve Power	Manual 70% Manual 90% Auto 2 Scans On Standard Pull Down
ICED SEA / ICEBERGS	Gain Sea Rain Scan to Scan Interf. Rej. STC Curve Power	Auto Manual 0% Manual 0% Off On Ice Normal

3.6.1 Which Preset is the right one ?

Harbour. Should be selected when navigating in short range inside a harbour, sea clutter is usually asymmetric and so it is processed with auto anti-sea clutter.

Medium Range. Should be selected when navigating with range scales from 3 NM to 12 NM, a standard anti-sea clutter level is provided.

Long Range. Should be selected when navigating with range scales > 12 NM, an increased anti-sea clutter level is provided due to the long pulse use. Echoes are enhanced to increase visibility.

Short Range/ Small Echoes. Should be selected when navigating with range scales < 3 NM. The system is always working on short pulse. Echoes are enhanced to increase visibility. Sea clutter residuals are filtered by scan to scan correlation.

Bad Weather. Should be selected in bad weather conditions with high rain downfall rates. The system is always working on short pulse. Clutter residuals are filtered by scan to scan correlation with the most effective setting. CFAR processing is applied over the Radar video.

Iced Sea /Iceberg . A special setting intended to increase the visualization of iced sea. Almost no video processing is applied. The anti-sea control is disabled, but when enabled operates with a special clutter attenuation curve.

3.7 TXRX INTERSWITCH MENU (STANDARD)

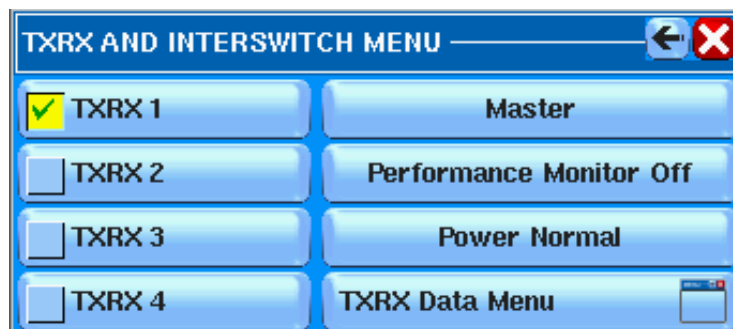


Figure 3.7.1 TXRX Interswitch Menu Window

Pressing TXRX and Interswitch button (Figure 2.5.9), normally labelled “TXRX *n mode*”, where “*n*” is the number of the selected transceiver and “*mode*” is “Master” if master or “Slave”, the “TXRX AND INTERSWITCH MENU” (Figure 3.7.1) will be displayed. In the first group of buttons, on the right, starting from the upper side the operator has the possibility to switch between Master and Slave mode, turn on or off the Performance Monitor and the Power Boost functions (where available) and visualise the TXRX data. The last button of the group displays a new window with all the available data regarding the status of the transceiver. The second group of buttons (Switch buttons), on the left, allows selecting the desired transceiver. The group could be from one to four buttons, according to hardware and software configurations.

3.7.1 Master / Slave

By means of the first button of the right column the operator can set the Radar system to be Master or force the operating display in Slave mode.

In Slave the TXRX is not controlled by the operating display. If the transceiver is controlled by another display or if it is in local mode, it is possible to use the Radar in a kind of “*read-only*” mode. Switching the button to Master mode the display requires being master, and if possible the TXRX can be fully controlled by the operating display. The status of the transceiver operating mode is continuously displayed on the TXRX Interswitch button (Figure 3.7.1). In case the TXRX Interswitch button is flashing in yellow color, the display is asking to be master, but the transceiver is controlled by another display with priority.

3.7.2 Performance Monitor ON / OFF

By means of this button the Performance Monitor function can be switched on and off.

The Performance Monitor facility (Figure 3.7.1) is provided for checking the performance of the transceiver, waveguide and antenna. The best way to use this function is to set the range scale at 24 NM, tune the Radar and adjust the gain control at about 90%. In this condition an intensified noise ring, positioned approx. at 24 NM should appear (Figure 3.7.2). The distance of the ring from the centre is forward proportional to the TXRX transmitted output power. When the Magnetron has decreased 10 dB in peak power, the ring's distance will decrease down to about 12 NM range.

The Performance Monitor ring should have a missing angular sector of some 60° to 100°. That missing sector is due to the RF beam really transmitted by the antenna. Any RF power degradation between the magnetron and the antenna output results in a smaller angular ring interruption. When the angular sector is reduced below 30°, the antenna section requires service.

The ring's width (thickness) is proportional to the tuning condition. The width of the ring for a good and correctly tuned radar will be approximately 2 NM.

The ring's strength (difference between background noise and ring's noise) indicates the receiver noise figure. If the receiver noise figure degradation is more than 10 dB, the P.M. ring is no longer distinguishable from the background noise.

Some installations may not require the Performance Monitor function. In such cases, the function and the button are disabled.

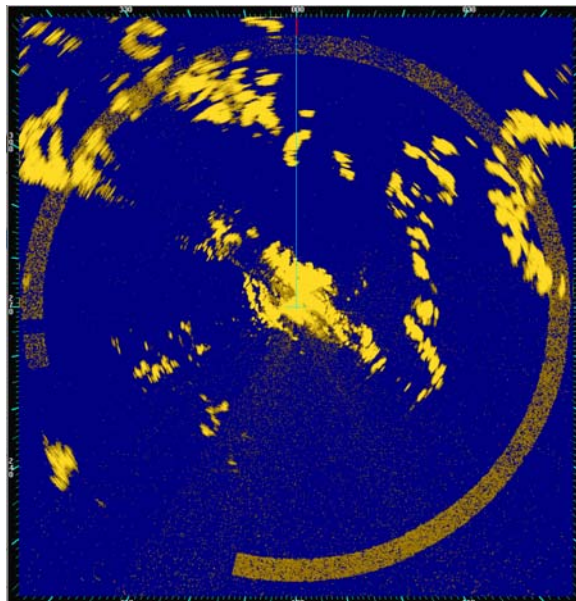


Figure 3.7.2 Performance Monitor ring

3.7.3 Power Normal / Boost

Pressing the “Power Normal” button (Figure 3.7.1), the “Power Boost” function will be displayed. This function permits operating with the Radar pulse lengths according to the following Table. In both modes, (NORMAL or BOOST), the functioning of the System is the same, changing only the transmission pulse length.

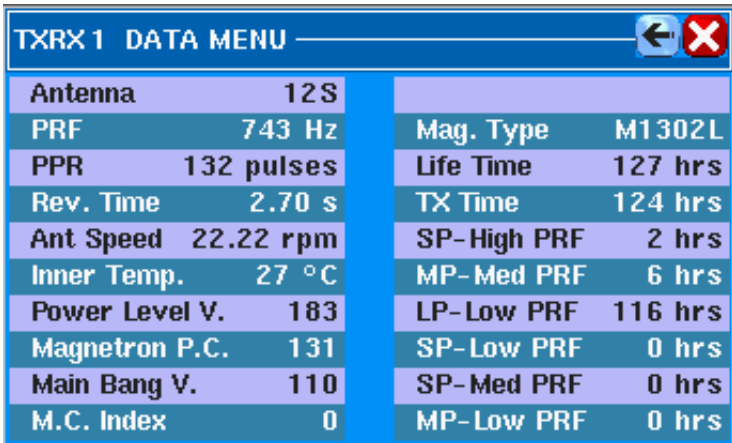
Range Scale (NM)	Normal (μ s)	Boost (μ s)
0.25	0.07	0.07
0.50	0.07	0.07
0.75	0.07	0.07
1.50	0.07	0.25
3.00	0.07	0.25
6.00	0.25	0.80
12.00	0.25	0.80
24.00	0.80	0.80
48.00	0.80	0.80
96.00	0.80	0.80

The operator has to operate carefully when selecting pulse length. The transmitted RF pulse length (the amount of energy) is an important factor of Radar characteristics, it determines the range resolution, the minimum and the maximum Radar detection range. Generally, the System, and the

operator, will select a longer pulse for longer detection range and shorter pulse for better discrimination of nearby targets at short range, such as in harbour manoeuvring. Be also aware that the more the operator uses the Power Boost, the faster the magnetron is consumed.

3.7.4 TXRX Data

By pressing the TXRX Data button, the “TXRX 1 DATA MENU” (Figure 3.7.4) will be displayed; in this window transceiver parameters such as the Antenna, PRF, Magnetron Lifetime etc.) are shown. These parameters will be utilised in order to set specific alarms (such as if the Internal Temperature is higher than 70°C).



TXRX 1 DATA MENU			
Antenna	12S		
PRF	743 Hz	Mag. Type	M1302L
PPR	132 pulses	Life Time	127 hrs
Rev. Time	2.70 s	TX Time	124 hrs
Ant Speed	22.22 rpm	SP-High PRF	2 hrs
Inner Temp.	27 °C	MP-Med PRF	6 hrs
Power Level V.	183	LP-Low PRF	116 hrs
Magnetron P.C.	131	SP-Low PRF	0 hrs
Main Bang V.	110	SP-Med PRF	0 hrs
M.C. Index	0	MP-Low PRF	0 hrs

Figure 3.7.4 TXRX Data Menu Window

In case of malfunction the TXRX Data Menu is useful for determining the source of the problem. The service engineer could ask the crew to check various values to plan what they are to expect when they come onboard and which kind of spares to bring.

WARNING

ONLY THE DISPLAYS CONNECTED TO NEW TRANSCEIVERS (MOSFET) CAN SHOW THE INFORMATION VISUALISED IN FIGURE 3.7.4. SOME SYSTEMS DO NOT SHOW ALL THIS INFORMATION, IT IS JUST AN EXAMPLE OF THE MOST DETAILED DATA MENU.

3.7.5 Standard Speed

By pressing this button, it is possible to select standard or high speed antenna rotation.

3.8 TXRX Interswitch Menu (Configuration Video Combination)

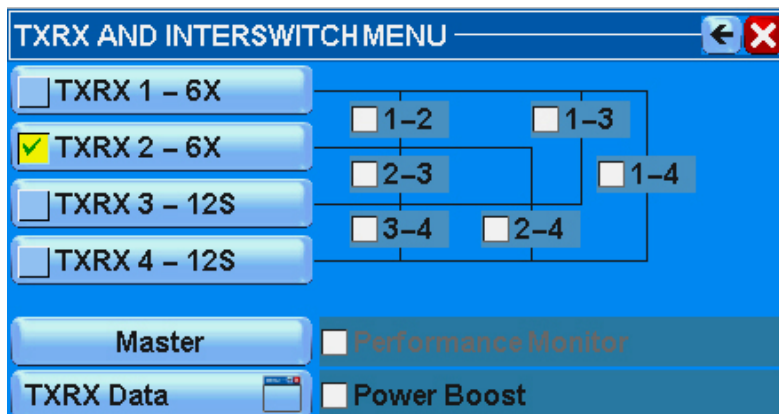


Figure 3.8 TXRX Interswitch Menu Window

This type of configuration, which is only available in wide screen mode, can combine up to four signals from TXRX transceivers with different antennas, positions and therefore, reception, according to the combinations shown in figure 3.8. The checkboxes show graphically the availability of the different combinations .

If the Additional PPI Mode is selected (see paragraph 2.5.11), the interswitch window will appear as shown below, permitting selection of different Radar Transceivers for each PPI.

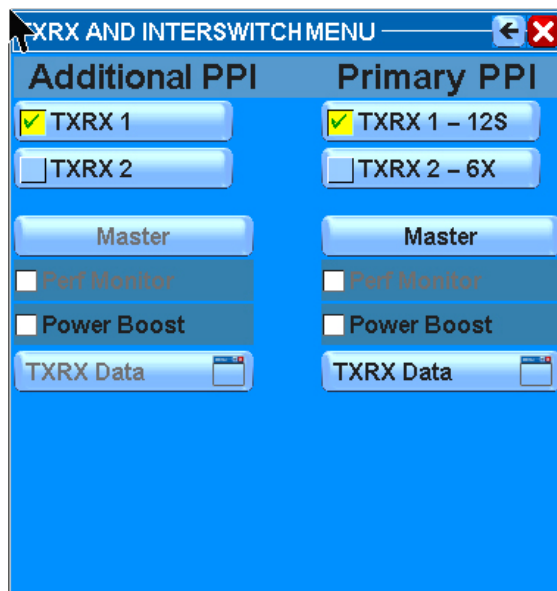


Figure 3.8.1 Interswitch menu with Additional PPI

It is possible to see the window shown in Figure 3.8.1 by selecting one of the two transmitter signal

presence indicators (see figure 3.8.2) using the shortcut in the bottom right, in the Row Under the PPI Area.



Figure 3.8.2 Row PPI Area

The combination of the four signals is important, as it optimises the ability to view a better quality image on the PPI in weather conditions such as rain or rough seas.

Thanks to this system and more signals, it is possible to have a wider view of the surrounding area, monitoring those zones that would otherwise be hidden from various obstructions, such as funnels and tall masts on some vessels.

The following section describes possible combinations and their characteristics.

It is important to configure the antenna position correctly as well as the alignment between the range and the azimuth and the adjustment of the input video level, as the two signals, A/B, will be submitted to the same video processing. It is advisable to use auto processing in case of Clutter from rain or sea.

For other functions on the screen shown in figure 3.8, such as “Master/Slave”, “Performance Monitor OFF/ON”, “Power Boost” and “TXRX Data”, please see more details in paragraph 3.7 TXRX Interswitch menu (standard).

3.8.1 Tracking and Video Processing operation in combination and 2nd PPI mode

When using the Additional PPI, the source and targets are the same as those viewed on the 1st PPI, given that the main source is the same as represented in the first transmitter of the first PPI.

In cases of video combination mode, there are two sources and these are selected in the configuration window shown in figure 3.8.1. As already mentioned in the previous paragraph, all antenna positioning considerations and alignments are set in the standard configuration mode in order to have a correct CCRP.

Video processing is fully split in Additional PPI mode, a double set of controls permits to optimize the detection according to the sensor and its operation mode.

Video processing in combination mode uses only a single control (SEA, RAIN etc..). The same video processing control is applied to both video sources, only the STC attenuation curves for the SEA control are optimized according the antenna characteristics (size, height etc...).

Most of these different combination modes are labeled A *function* B. As mentioned in the menu window A is the channel connected to TXRX with lower identification number, B is the one with the higher. Numbers are depending of the connections enabled by the checkboxes in the same window.

3.8.2 A or B Combination

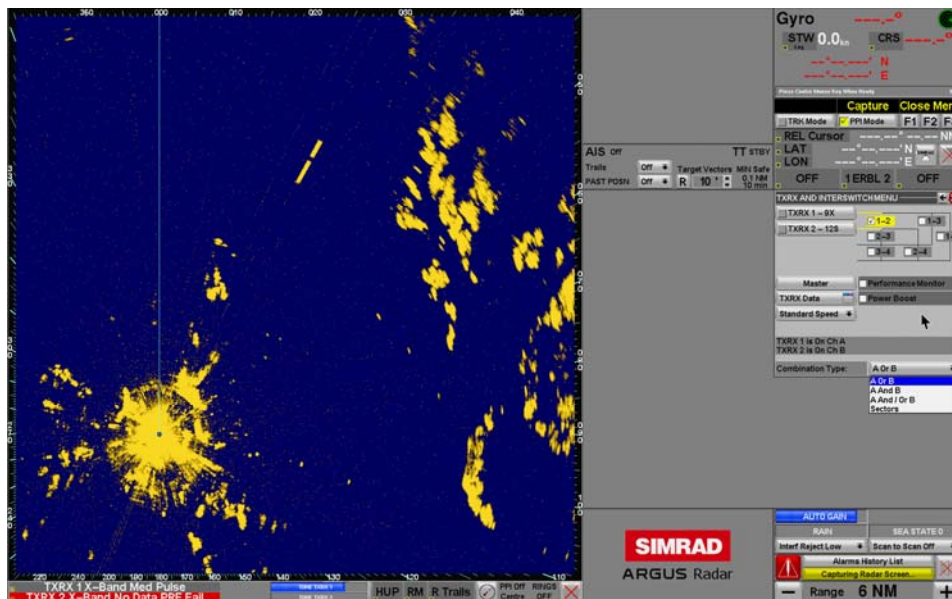


Figure 3.8.3 A or B combination

Once the correct setup on “INTERSWITCH MENU” has been selected from the menu with the antennas you wish to use for this purpose, under the item “Combination Type”, select the detection mode, such as “A or B”, for example (see figure 3.8.3). The combined picture will display echoes received on both transceivers also if an echo is visible only from a single RADAR antenna.

This mode should be used for better detection on distant echos after previously suppressing clutter caused by sea waves or rain

3.8.3 A and B Combination

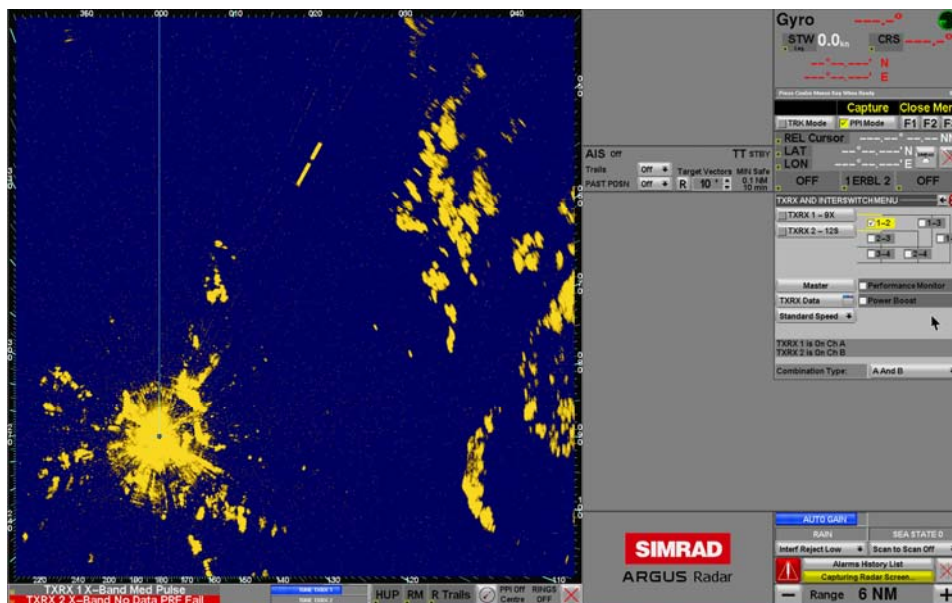


Figure 3.8.4 A and B combination

Selecting the “A and B” detection mode (see figure 3.8.4) in case of strong sea or rain clutter, it is possible to correlate targets and eliminate clutter residues.

WARNING

ALL COMBINATIONS SHALL BE USED ONLY WHEN FULL 360° VISIBILITY IS AVAILABLE FOR EACH RADAR OR AT LEAST WHEN BLIND SECTORS ON BOTH TRANSCIEVERS COINCIDE; OTHERWISE BLIND SECTORS WILL APPEAR ALSO IN THE RADAR ZONES WHERE AT LEAST ONE TRANSCIEVER CAN STILL SEE CORRECTLY WITHOUT IMPEDEMENT. IN THIS LAST CASE, THE OPTIMAL COMBINATION TYPE IS SECTOR ONE:

3.8.4 Sector Combination

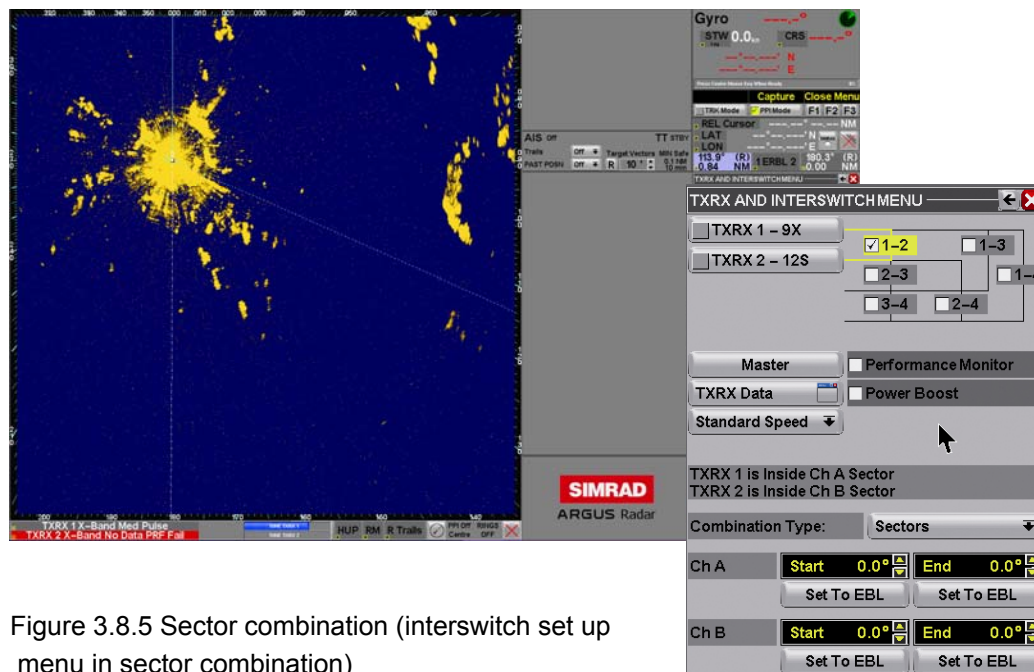


Figure 3.8.5 Sector combination (interswitch set up menu in sector combination)

This combination mode, known as “Sector” (see figure 3.8.5), is used to permit a full RADAR vision on 360° in case blind sectors are present or one or more blanking sectors are configured during installation. Blind sectors are caused by obstacles situated in front of the antenna’s radiation beam, reducing the possibility of signal reception on the RADAR presentation.

To get around this problem, it is possible to set the receive angle (first selecting the transmitters (TXRX 1 and TXRX2), changing its value with the Spin Buttons (see figure 3.8.5.1) or using the actual EBL angle position.

As explained in the menu window, the sectors delimitates reception from TXRX 1 (Sector 1 defined from Start and End limits) and from TXRX 2 (Sector 2, Start and End limits).

The following figure shows in which way two radar pictures with blind sector can be combined in a single PPI presentation where radar visibility and tracking functionality are available for the full 360°.

ARGUS RADAR

Radar presentation and video processing

Red line: Sector1 TXRX1 reception angle

Blue line: Sector2 TXRX2 reception angle

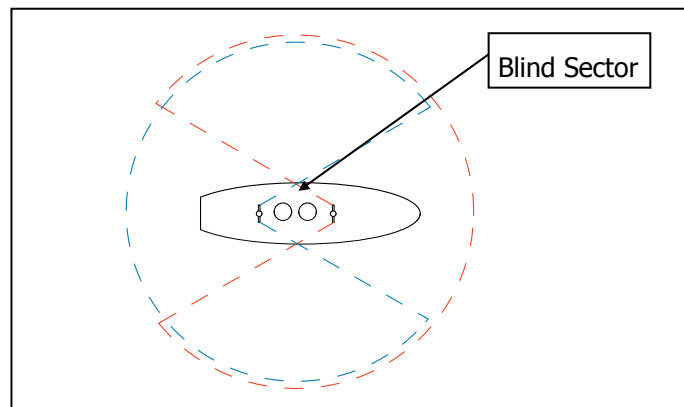


Figure 3.8.5.1 Blind Sectors

3.8.5 A and/or B Combination

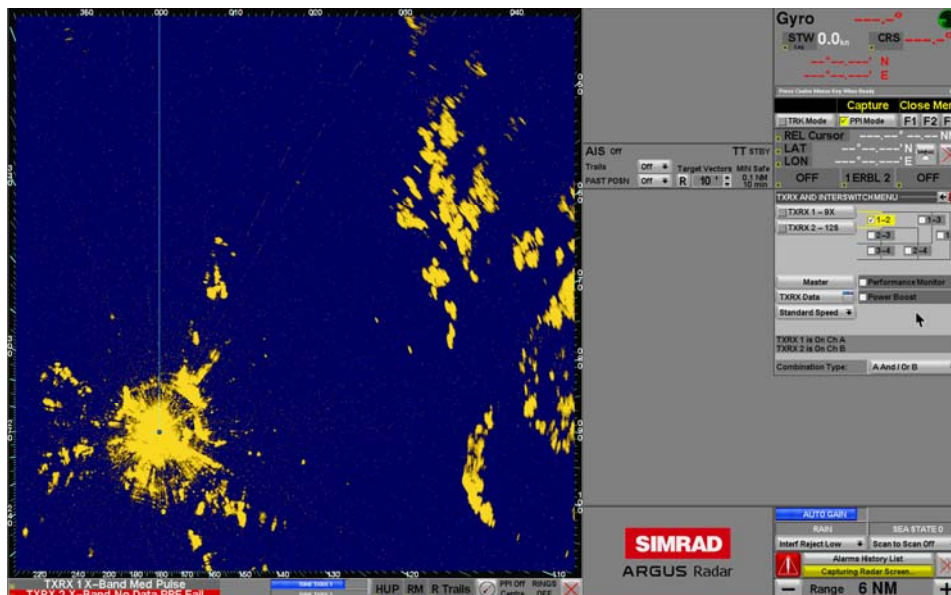


Figure 3.8.6 A and/or B combination (interswitch set up menu in sector combination)

This combination mode is used to get both benefits of the AND/OR combinations. Up to the range where the sea clutter can be present, which depends of antenna type and height, the combination is following the AND mode to suppress the sea clutter correlating of the two input sensors that scan the same area at slightly different time (antennas are not synchronized). Beyond sea clutter range, the mode is switched to OR, where it can improve the detection of far / dim echoes.

WARNING

Since the inputs to two antennas, that are not synchronized, are being combined, the delay between the updates of the two images can be as much as one scan of the antenna (the fastest one). If the ship manoeuvres at a speed above $\sim 40^\circ/\text{min}$, the same echo could appear twice in the same scan.

ARGUS RADAR

Radar presentation and video processing

Radar echoes of the size listed in the following table can also be represented twice on the screen. The table takes into consideration the worst case scenario of antennas that are completely out of synch by 360° and therefore, the dimension limits are usually greater than the ones provided here, and according to the scale being used, this problem might not be visible.

Depending on the antenna rotation rate and target speed, the table shows the minimum ship length necessary for not showing two separate echoes (in OR mode) or an echo suppression (in AND mode).

V (KN)	20rpm	40 rpm
10	16 m	8 m
20	30 m	15 m
40	60 m	30 m
70	120 m	60 m

CHAPTER 4 MEASUREMENT

4.1 RADAR ECHO MEASUREMENT

The position, speed, course, distance and bearing of Radar echoes can be performed in several ways:

- Measurement by means of Range Rings and Bearing Scale.
- Measurement by means of the Cursor.
- Measurement by means of the ERBL 1 or 2.

The following Table shows the advantages and disadvantages for each of the above Measurement Modes.

Measurement Mode	Advantages	Disadvantages
Range Rings and Bearing Scale	Fast measurement	Very low accuracy
Cursor	Precise measurement Fast measurement	Changing the scale, the cursor remains on the same physical position on the PPI, changing the information.
ERBL	Precise measurement Changing the scale, the cursor remains on the same distance.	The operator does not get a fast measurement

Figure 4.1.1 Target Measurement Mode

4.1.1 Measurement by means of Range Rings and Bearing Scale

The Measurement by Range Rings and Bearing Scale is used when it is not necessary to have an accurate value, but it is sufficient to have an approximate one very quickly.

4.1.2 Measurement by means of the Cursor

Placing the trackball cursor over the echo, very low accuracy in the Cursor Area (Figure 2.3.2, Cursor and Markers section, first row) will display the range and bearing to the cursor.

If the system is connected to a position source (i.e. GPS), this Measurement Mode will also indicate the geographic position of the echo right under the range and bearing (Figure 2.3.2, Curser and Markers section, 2nd and 3rd row).

4.1.3 Measurement by means of the ERBL 1 or 2

In order to measure the bearing and range to a target by means of one of the two available ERBL, the operator need to:

- Turn ON one of the two ERBL, 1 or 2, by pressing the correspondent push-button on the Keyboard (Figure 2.2.2, pos. 3) or by activating the ERBL using the shortcuts on the row under the PPI Area.
- Drag the EBL or VRM (or both), using the centre SK (keeping it pressed) until the trackball marker is over the target. PPI mode is automatically selected turning ON the ERBL).
- Release the SK and read the values next to the ERBL Area.

The readings are the bearing and range to the echo.

Dragging the VRM is only possible in PPI mode, place the trackball cursor over one point of the circle, press the centre SK and move the trackball keeping the SK pressed until the circle is at the desired distance.

Dragging the EBL is only possible in PPI mode, place the trackball cursor over one point of the line, press the centre SK and move the trackball keeping the SK pressed until the line is placed at the desired angle.

Dragging both of them simultaneously is only possible in PPI mode, place the trackball cursor over the point of intersection between the circle and the line, press the centre SK and move the trackball keeping the SK pressed until the intersection is placed at the desired position.

Note: On the keyboard, the EBL and VRM can be adjusted with two (encoders) placed at the bottom corners of the panel (Figure 2.2.2). Making the adjustments from the keyboard is more accurate and we suggest using this method instead of dragging the markers.

The “EBL *n*” button is affixed by “R” (Relative) if it is relative to own ship’s heading, or “T” (True) if it is referenced to the North. The visualization mode can be changed by pressing this button and it will toggle between “T” and “R”.

In order to measure the distance between two echoes, it is possible to move the ERBL out of the centre of the PPI. This operation can easily be performed just by dragging the centre of the ERBL to the first echo, using the centre SK (only in PPI Mode). In the same way, drag the VRM over the second echo and the range value will represent the distance between the echoes. To move the ERBL back to the centre of the PPI, just press the “Off Cent” labelled button next to the selected ERBL.

NOTE This measurement mode allows to get an accurate measurement and the operator has to utilise this mode when the situation requires precise data.

It is important to use maximum range to obtain the best precision for the measurement. The right scale must be selected in order to see the target at the maximum range where visible, so that the measurement is close at its maximum accuracy. In order to increase the measurement precision, it is advisable to place the PPI in OFF Centre Mode. In this way the Range can be increased and therefore the precision as well.

The VRM provides a more accurate measurement of the Range to an echo. The two VRMs will be visualised on the PPI as dashed rings, so that the operator will be able to discriminate them from the fixed range rings. The two VRM rings can be distinguished by different colors and different type of dashes: The selected one is white and dot-dashed, the other one is cyan and only dashed.

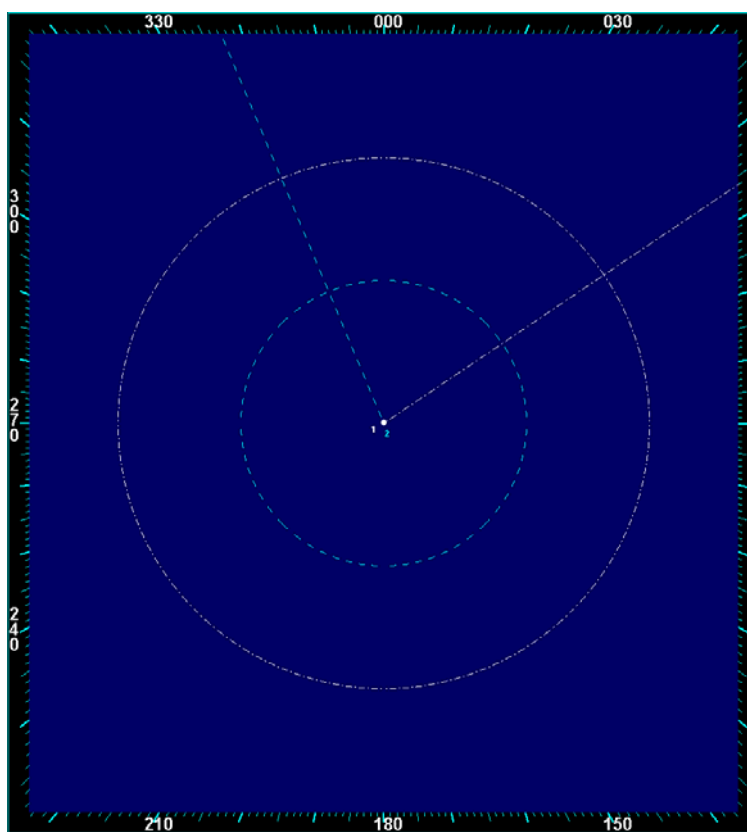


Figure 4.1.3 EBL 1 – 2 Visualisation

When the EBLs (1 or 2 or both) are not used, the operator can turn them OFF by performing the same procedure used to turn them ON.

4.2 MORE TARGET DATA MEASUREMENT

The two EBLs can be used at the same time in order to perform special operations, such as:

1. Control the anti-collision manoeuvre. As explained in the previous paragraph, the origin of the EBL can be placed anywhere, by means of the trackball, in order to get measurements between targets (bearing and range). This facility can be utilised in order to verify a potential risk of collision. The operator should place the EBL origin on the echo of interest and after at least three minutes, rotate the EBL until it bisects the echo at its new position. The EBL readout will display the ship's course, true or relative (depending on the type of presentation selected). If Relative Motion is selected, it will be possible to calculate the CPA as well. If the EBL passes through the origin (own ship), the echo is on collision course. The second EBL can be switched ON to measure the distance between Own Ship and the EBL aligned with the course of the echo: that's the CPA.
2. Observe any danger under way or in convoy areas. By means of the EBL function, which allow to place the origin anywhere, it is possible to set the two EBLs in order to define a Guard Zone or to observe the ship's course or distance from the coast or from possible danger to the navigation.

4.3 CURSOR SECTION

In the Cursor Section (Figure 4.3) of the System Data Area, all the Parameters relevant to the cursor are displayed. The information displayed are described in the following sub-paragraph.



Figure 4.3 Data System Area – Cursor Section

4.3.1 Cursor

The Cursor Polar Position (Range and Bearing) is displayed and it can be toggled between True and Relative. If heading data is missing, the True information is not available.

4.3.2 Latitude and Longitude or ETA and TTG

These fields normally indicate the Geographic Position of the Cursor. The position is not displayed if the cursor is not inside the PPI and if no EPFS is connected.

The operator, according to his needs, has the possibility to display ETA and TTG to the cursor position. The switch between the two presentations can be easily performed moving the trackball onto the “Latitude” and “Longitude” labels observing the Help Line. The Help Line related to the left SK will indicate “ETA / TTG” (if the presentation is already about ETA and TTG it will indicate “Lat / Lon”). In ETA and TTG mode, the system will indicate the estimated date and time of the eventual arrival at the point where the cursor is placed (ETA, expressed in hh-mm dd-mm-yyyy) and the time needed to arrive at that point (TTG, expressed in dd hh-mm).

To display ETA and TTG, the cursor must be placed inside the PPI at a bearing of $\pm 45^\circ$ relative to Own Ship course.

NOTE

ETA can be displayed only if an external time source is connected (i.e. GPS) or a manual date and time is set.

NOTE

Both ETA and TTG are not displayed if the speed source is in failure or if the speed is lower than 0.1 KT.

4.4 ERBL 1 AND 2

The operator has the possibility to use up to two sets of ERBL (Electronic Range and Bearing Line) and select between “Relative and True” and “Centre and Off Centre” for each set. The three shortcuts in the next picture allow to visualise the ERBL on the PPI or not; passing with the mouse pointer over them, the Help Line will

show the possible choices; On/Off and True/Relative ERL. When an ERL is active, the respective shortcut will show the range of the VRM in NM and the bearing of the EBL in degrees.



Figure 4.4 Data System Area – Cursor Section

By default, the ERL center always follow the ship's position in every presentation mode, so when the ship changes course the center will move accordingly.

It is also possible to lock each ERL center to the current geographic position.

The choice is available by pressing the two trackball push-buttons when the cursor is over the left or right part. Two options available are: "Geolock" and "OS.Lock".

The Anchor symbol on the left means that the ERL is locked to a geographic position and the same symbol is shown near the display ERL center, see the following figure 4.4.1.

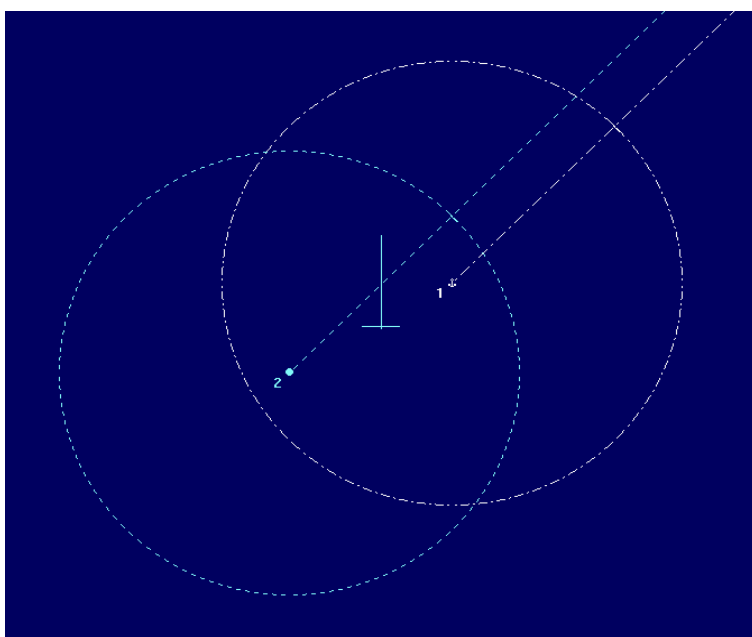


Figure 4.4.1 ERL1-ERL2

In this example, the ERL 1 is geographically referenced and the ERL 2 is locked to Own Ship.

The same function is available from the Cursor Menu.

When the geographic position or the heading is not available, the ERL center will be reset to OS Lock.

It is not possible to set the Geo Lock option when the EPFS or heading sensor are in failure.

It is possible, however, selecting the ERL 1 and VRM 1, to display them independently.

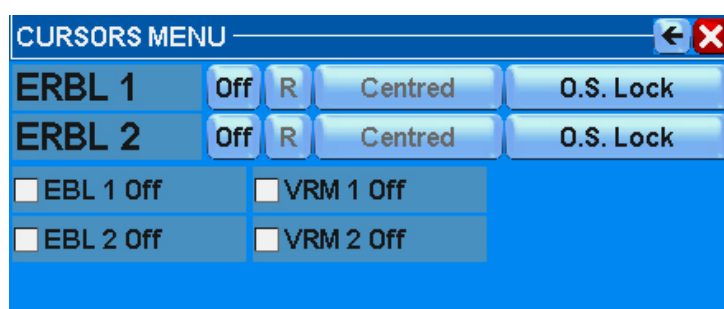


Figure 4.4.1.1 Cusor Menu

4.5 PARALLEL INDEXES

To enable their visualisation, the buttons on the first column on the left, related to the Parallel Indexes, where the On / Off indicates the actual status, the smallest buttons in the centre can be labelled “Rel” or “True” and they change the meaning of the bearing value. The default distance between lines and north stabilised checkbox are on the right.

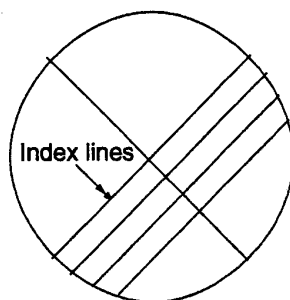


Figure 4.5 Parallel Indexes

When the Parallel index is selected, the display status changes to On and all four parallel indexes are displayed. After this step, every PI can be disabled independently, and operated in its own checkbox.

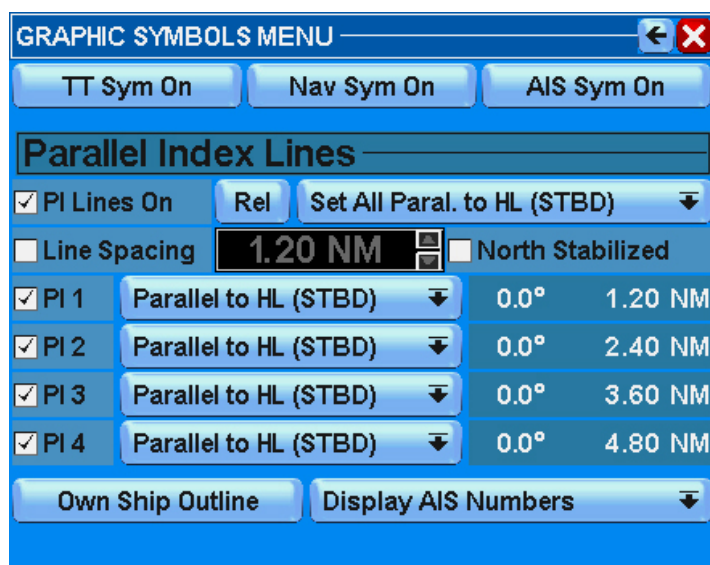


Figure 4.5.1 Graphic Symbols menu

The list “Set all Parallel Index to HL” enables one of the possible fast alignment modes. The selections available are:

- All Parallel Index to HL (Stb)
- All Parallel Index to HL (Port)
- All Parallel Index to EBL
- All Parallel Index to PI x (from 1 to 4)
- All Parallel Index to ERBL (1 and 3 to STBD and 2 to 4 port)

Every PI has its own list where it is possible to choose a fast alignment option:

- PI To HL (Stb)
- PI To HL (Port)
- PI To EBL
- PI To ERBL (Stb for 1/3 and Port for 2/4)
- PI To VRM Range

All these functions permit to automatically follow the direction of HL/EBL/ERBL. The PI distance from the center follows the VRM in VRAM Range and ERBL modes.

Once the index lines are displayed on the PPI, the operator can set their position and angle correctly by the trackball. In fact, in PPI Mode, placing the trackball cursor on a line and following the Help Line (centre SK says “Select”), the operator will be able to hook the line by pressing the centre SK and keeping it pressed, then, moving the mouse, the line will turn and it will be released when releasing the centre SK. To move the line at the right range, perform the above operation hooking the point drawn on the index line.

NOTE

When the parallel index is selected and moved manually, the respective label changes to “Floating” and the List status to “PI Lines Independent”

When the North Stabilised checkbox is enabled, the parallel indexes are always maintaining their direction in respect to north.

It is suggested to select the Parallel Lines True when the reference is geographic, such as a coast line, and the Parallel Lines Relative when the reference is a moving reference, such as another ship.



On the display’s lower bar, the PI push-button is shown on the left in both possible states, which permits a fast access to the Parallel Index Menu. The button reflects also the status of the Parallel Index Function. When not enabled, a red cross is overlaid the PI icon.

4.5.1 Range Rings



The function of the Range Rings button is to switch On / Off the visualization of the Range Rings, and display their status and the distances between the rings.

The Range Scales available are: 0.25, 0.5, 0.75, 1.5, 3, 6, 12, 24, 48, and 96 NM.

If the Range Rings are On, the distance between two adjacent rings is automatically shown at the Range Scale selection. The related values are: 0.05, 0.1, 0.25, 0.25, 0.5, 1, 2, 4, 8, and 16.

The long range scales provide the best overview of own ship in relation to land masses, weather fronts and large ship targets in or beyond view.

The short range scales provide greater detail of the Radar echoes close to own ship, and should be used as the ship approaches the coastline, harbour or other vessels in the area.

CHAPTER 5

TRACKING

5.1 GENERAL INFORMATION

5.1.1 Radar Target Tracking Facility

5.1.1.1 General

The Radar system includes a facility for acquiring and automatically tracking Radar echoes. Each Radar target center is used to estimate the relative speed and direction for anti-collision purposes.

5.1.1.2 Tracking Error Sources and Effects

There are some factors that can generate errors and confusion in tracking and/or reduction of target detection capability to the Radar operator. Such factors are:

- Sea, Rain, Snow and Low Clouds Returns
- Radar Interference
- Sidelobe Echoes
- Blind Sectors

Low Signal to Noise Ratio and Signal to Clutter Ratio.

5.1.1.3 Sea, Rain, Snow and Low Clouds Returns

Sea returns are caused by the reflection of the Radar electromagnetic wave by the surface irregularities of the sea and by the water droplet layer existing in the vicinity of the sea surface. They are displayed as a bright circular area (sea clutter) around the PPI centre having a radius that, depending on the sea state and the height of the antenna, can be up to 6-7 NM.

Rain, Snow and low Clouds Returns have two main effects on the Radar electromagnetic wave

- Attenuation
- Masking effect

The first effect reduces both the power of the direct signal hitting a target and the signal returning to the antenna after reflection from the target. The second effect is due to the electromagnetic wave reflected by rain drops and ice crystals and appears as a bright area (rain clutter).

Radar echoes in sea or rain clutter areas are practically more or less masked by the clutter. In order to minimise this problem, the operator must adjust the MANUAL SEA/RAIN controls or select the AUTOMATIC SEA/RAIN controls.

Tracking targets entering these areas cannot work properly. Generally the effects of such errors

appear as continuous big changes of the target course and speed vector. Sometimes the target symbol, having acquired high speed, can slip away from the real target position after a certain time resulting in loss of the target triggering the LOST TARGET ALARM.

These errors, in not very extreme weather conditions, can normally be avoided or at least minimised by the operator with proper adjustments of SEA/RAIN controls. Refer to Para 3.3.3 and Para 3.3.4.

WARNING

The echo used as reference should be a stationary target, otherwise all the speed data calculated will not be true, but only relative to the reference target. Do not select a ship that is anchored. No alarm will be signalled when the ship starts to move and all the calculated true speed will change to erroneous values.

5.1.1.4 Radar Interference

Occasionally, another Radar operating in the same frequency band can generate interference. Normally this appears on the Radar screen as a series of spirals. The main characteristic of the interference is that it is not sweep to sweep correlated. For this reason this should not generate errors in the tracking process due to the sweep to sweep correlation performed by the video extractor. In very rare cases, when the interference falls on the tracked target, it can cause a deformation of the size of the echo and consequently a small displacement of its centre of gravity; this can generate a momentary small error in the course and speed values. Refer to Para 9.4.1.

5.1.1.5 Sidelobe Echoes

Radar antennas have a radiation pattern consisting of a main lobe and several very small sidelobes. Most of the energy transmitted by the Radar is radiated and received back on the main lobe, and a very small part on the sidelobes. This problem has no effect in case of distant or small targets, but the returns from a large target at short range (less than 3 NM) can generate, on both sides of the main echo and at the same range, arcs or series of small echoes.

These effects, when they are an extension of the main echo, can cause momentary errors for the tracking, course and speed values given by the tracking can become unstable. Normally the problem can be eliminated or strongly reduced by an accurate adjustment of the SEA control.

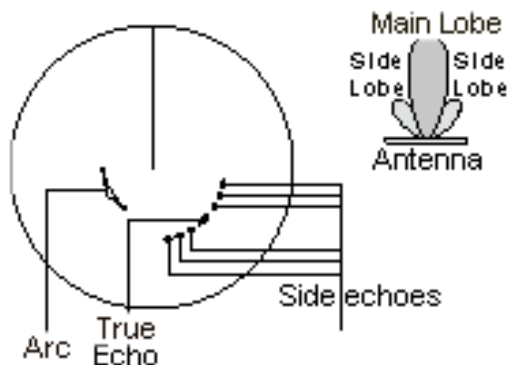


Figure 5.1.1.5 - Sidelobes

5.1.1.6 Blind Sectors

Funnels, masts (when located near the Radar antenna) may cause blind or shadow sectors, where the target visibility may be completely lost or strongly reduced. In these sectors the tracking will be very difficult and targets remaining there for long time (not seen for more than 10 antenna revolutions) will be lost triggering the "LOST TARGET ALARM".

5.1.1.7 Low Signal to Noise Ratio and Signal to Clutter Ratio

In situations where the signal to noise or the signal to clutter ratio of the Radar echoes is less than approximately 3 dB (small vessels in heavy sea or rain clutter, or big vessels close to the Radar horizon), target detection is very poor and the tracking will not see the target at each antenna revolution, this will cause errors in the tracking, that can range from missed information and up to complete loss of the target when it is missed for 10 consecutive antenna revolutions.

WARNING

The speed and course of a radar target are obtained by consecutive measurements of the echo position. The data is then filtered to reach the required precision.

This means, that every abrupt change of speed and direction will be recognized with a certain delay to reach absolute certainty that the target is moving in a different way.

The confirmation delay is about five scans and after that some additional time is needed to reach the same data precision as from before the manouvre.

5.1.2 Tracking operation in 2nd PPI zone and under video combination mode.

When operating in the Additional PPI, the source and targets are the same as viewed in the first PPI, given that the main source is the same transmitter of the first PPI. In any case, it is not possible to operate on Tracked Targets or AIS.

Using video combination mode, there are two sources and there will be two tracker processes operating separately on the two single channels. The two sources are then brought together in a single System Track, where the kinematic data represent a combination of the data from the two individual trackers.

More specifically, the data from the trace where the estimated positioning error is the smallest is favored. The tracker function evaluates trace quality by using the best number of scans out of ten when combining the two set of data.

In the case that one of the trackers has to follow a trace through a blind sector, the position used to track the radar echo is indicated by the information supplied from the other tracker.

The trace is declared as Lost only in the case that both trackers cannot see an echo at the position extrapolated by the system track for at least ten scans,.

5.1.3 AIS (Automatic Identification System)

5.1.3.1 General

The AIS (Automatic Identification System) is a shipborne broadcast system that can act like a transponder, operating in the VHF Maritime band. It is capable of handling over 5000 reports per minute and updates as often as every two seconds. The information is coded and the system allows exchange of the information among all the ships operating in the same area. The system is based on the VHF channel, RX one and TX the other, and uses Self Organising Time Division Multiple Access (SOTDMA) technology to meet this high broadcast rate and ensure reliable ship to ship data exchange.

Every channel is divided into time slots. During these slots, information related to the ship and information from other ships in the area are exchanged.

Each AIS system consists of one VHF transmitter, two VHF TDMA receivers, one VHF DSC receiver, and a standard marine electronic communications link to shipborne display and sensor systems. Position and timing information are normally derived from an internal or external global navigation satellite system (e.g. GPS) receiver, including a medium frequency differential GNSS receiver for precise position in coastal and inland waters. Other information broadcast by the AIS, if available, is electronically obtained from shipborne equipment through standard marine data connections.

The information exchanged come in two main groups: Static and Dynamic data. Static information does not require a high refresh rate. Name, Call sign, Tonnage, Destination, ETA do not change and are forwarded. The Dynamic information, such as position, course, speed, heading, ROT, etc. Is changing constantly. Therefore, this information is forwarded at a high refresh rate and according to the ship operation. If the ship is anchored or moored, the data does not change and the refresh rate is very low, for example 3 minutes (in these conditions, the system can control up to 5000 ships). If the ship is docking or moving at low speed, the refresh rate is higher, yet still low e.g. 1 minute. The refresh rate increases proportionally to the ship's speed. And if the speed is higher than 14 Kn, the refresh rate is about 2 seconds.

As mentioned above, the AIS can (in theory) control up to 5000 ships. It is important to underline that the maximum number, which can be displayed, is 200. The System monitors all received targets, but will display only the 200, according to the priority set (see AIS LIMIT PRIORITY).

The AIS is used during target association to help the tracking process in identification of a possible dangerous situation like target swap, manoeuvre and to provide a stable source of position when the echo is fading from scan to scan.

5.1.3.2 The System Advantages

The AIS provides the following advantages:

- the position data, provided by GPS, has a precision higher than the Radar data.
- it is possible to visualise ships covered by a natural obstacle. The Radar signals are reflected by the natural obstacle, such as coastlines, mountains, hills etc, while the VHF radio wave will be received.
- clutter does not affect the data, therefore it is possible to visualise the target even in rain or sea clutter.
- the information provided is more detailed than provided by the Radar. The Radar information is course, speed, position, while the AIS also provides heading, name, ID, etc. The Radar provides the ship's heading only at short distance (shorter than e.g. 5 NM).
- the AIS provides the ROT, information useful to understand if the ship is manoeuvring or not.
- the AIS continue to operate even when a failure occurs to the Radar, which is very important for collision avoidance.

WARNING

The AIS presentation is available only if these conditions are fulfilled:

- AIS data through serial line available.
- Gyro compass heading available.
- EPFS valid position and datum available with reference position in WGS84. When the local datum is different from the reference datum, the correct position offset shall be available.

5.1.3.3 Operating

All information is forwarded to the Monitor by means of a serial line. It is necessary to set up the System properly, in order to receive this type of information.

The operator enables the AIS function (Target Data Reception and Visualisation) by selecting the button "AIS ON" in the "RADAR TARGET AIS Menu" window (Figure 5.7.1), and will disable the AIS function by selecting the button "AIS OFF". According to this selection, Own Ship window, first row (Figure 2.3.1, Figure 2.3.2) will display the AIS operating Mode (AIS ON/AIS OFF); if any failure occurs to the AIS, the selection will remain "AIS ON", but the visualisation in Own Ship window will change to "AIS OFF". The AIS operating mode will display AIS OVERFLOW with a different color background when the system limitation for displayed AIS is reached.

The AIS will cease to operate, when:

- the corresponding On / Off button is set to "AIS Off".
- Own Ship positioning system, or Own Ship gyro, is out of order or the data is invalid. In this situation, the AIS switches automatically to AIS OFF mode; in fact, it is not possible to compute any relative data.
- Own Ship speed data is not available or incoherent. It is not possible to compute any relative data.
- the speed source is not defined. With AIS it is not possible to fill in the speed manually, or use the auto drift speed. It is possible to use the EPFS speed and the stabilised log speed (SOG/COG or STW/CRS). When the speed is established, in Own Ship and TARGET DATA MENU window, it will be displayed in SOG or STW, according to the stabilisation.

5.1.4 Tracking Target Symbols

-  RADAR Tracked target in Initial state (just been acquired).
-  RADAR Tracked target in Steady state (two minutes after the acquisition).
-  RADAR Tracked target in Data Request state (selected).
-  RADAR Tracked target inside a Guard Zone (red flashing).
-  RADAR Target Dangerous Target (red flashing).
-  RADAR Tracked target in Lost state (after 10 scans of no visibility, red flashing).
-  Auto Drift Reference Target.
-  Anchor Watch Reference Target.
-  Trial Manoeuvre in execution (flashing).
-  Radar Target Training in execution (flashing).

-  AIS Sleeping Target.
-  AIS Activated Target (after acquisition) with no valid heading information.
-  AIS Activated Target (after acquisition) with valid heading information.
-  AIS Danger Target (red flashing).
-  AIS Lost Target (after its own timeout depending on its true speed, red flashing).
-  AIS Target in Data Request state (selected).
-  AIS Aton (Off Position = Red Color)
-  Virtual AIS Aton
-  AIS Search and Rescue Transponder (SART)
-  Base Station
-  Associated Track. Source data from AIS
-  Associated Track. Source data from Radar Target

AIS Target		Description of Symbol
Sleeping Target		Indicated by an isosceles, acute angled triangle with its centroid representing the target's reference position. The most acute apex of the triangle will be aligned with the heading of the target or with its COG, if heading information is not available. The symbol of the sleeping target may be smaller than that of the activated target.
Activated Target	a	Indicated by an isosceles, acute angled triangle with its centroid representing the target's reference position. The most acute apex of the triangle will be aligned with the heading of the target or with its COG, if heading information is not available. The COG/SOG vector will be displayed as a dashed line starting at the centroid of the triangle. The heading will be displayed as a solid line of fixed length starting at the apex of the triangle.
	b	A flag on the heading indicates a turn and its direction in order to detect a target manoeuvre without delay.
	c	A target without COG and SOG.
Selected Target		A square indicated by its corners will be drawn around the target symbol.
Dangerous Target		Indicated by a bold line clearly distinguishable from the standard lines to draw the symbol. The size of the symbol may be increased. The target will be displayed with vector, heading and rate of turn indication. The symbol will flash until acknowledged. The triangle will be red on color displays.
Lost Target		Indicated by a prominent solid line across the symbol, perpendicular to the last orientation of the lost target. The symbol will flash until acknowledged. The target will be displayed without vector, heading and rate of turn indication.

Table 5.1.1- AIS Target Symbol Description

Notes:

If, for some reason or due to a failure, in the Target message data, the speed datum is not received, the CPA/TCPA computing will be impossible and the AIS Target will assume a symbol of a big dotted triangle. If a Radar target and an AIS Target are placed at same position, but they are not merged, the AIS target will have first priority and the second priority will be the Radar Tracked target.

5.1.4.1 Operating with the Radar target

The Radar target main operations are:

- Manual Acquire.

Select a suitable Radar target, an echo that is not sea/rain clutter or a landmass. The echo should be well distinctable from other similar targets and not too near Own Ship. Press the ACQUIRE push-button on the control panel, or the trackball relative button (Tgt Acquire when in Track Mode). The echo under the trackball cursor will be acquired.

After 1 min. the symbol will show a trend vector, this means that the speed evaluation is still not stable and precise, but enough for giving a hint about the speed and direction.

After 3 min. the symbol will become steady and all the Data fields of selected targets will be available. Only in this status the CPA/TCPA anti-collision functions will be enabled.

- Target Selection. After being acquired each radar target can be selected moving the cursor over the symbol and pressing the SELECT push-button on the control panel or the related trackball button (Tgt Select when in Track Mode).

The target data window will open, if this is the first selected target, displaying the primary information from the tracking process (a radar target has no Name, MMSI etc.).

- Manual Cancel. After being acquired each radar target can be cancelled moving the cursor over the symbol and pressing the CANCEL push-button on the control panel or the related trackball button (Tgt Cancel when in Track Mode).

If the symbol was selected, the relative information on the target data window will be deleted as well.

WARNING

The operational availability of the tracking function is continuously checked to warn the operator in case of malfunction.

Various failures can be detected and displayed inside the System Failure window. The failures are listed and explained in Chapter 7.

5.1.4.2 Operating with the AIS target

NOTE

The AIS operating is equivalent to the relevant Radar Target functions.

Operating within the AIS it is possible to perform the same operations performed in the RADAR Target System, Figure 5.7.1 displays the operations performed only by the RADAR Target (left column), by RADAR Target and AIS and only by the AIS (lower two buttons).

The only operations the operator can perform with the AIS Targets. are the acquisition and the selection. It is not possible to discard the sleeping target, which is equivalent to the Radar echo. What the operator can do is only to switch the AIS to sleeping. Having the AIS sleeping target, the symbol will become bigger, the heading and the COG / SOG vector will be visualised. If the ship is turning, a turn indicator will be visualised. The selection of a sleeping target provokes its acquisition, plus the visualization of its data in Targets Data Window.

The sleeping AIS Target will automatically be acquired by the system when:

- entering an Auto-Acquisition Zone or in the Guard Zone / Auto-Acquisition Zone. The AIS Target doesn't change, but a message will be visualised "AIS Target in Guard Zone";
- the CPA / TCPA are lower than the set minimum safe value. In this situation the AIS Target is classified by the system as dangerous.

NOTE

The operator cannot de-activate the dangerous AIS Target. When 95 AIS (95% capacity) or more are activated, the Warning message "ACTIVE AIS CAPACITY ABOUT TO BE EXCEEDED" is displayed. After 100 activated targets are reached, a new activation replaces the farthest AIS and the message "WARN: MAX AIS CAPACITY REACHED" is shown.

As soon as the AIS Target is acquired, the related Data Information will be displayed in the information area by means of the "Target Data Window". The window displays the AIS data and the RADAR TARGET data. The RADAR TARGET and AIS information is visualised in the Target Data Window (Figure 5.24.1):

- Target ID
- Ship's name
- MMSI (Maritime Mobile Service Identity)
- Call sign
- Range and Bearing
- SOG and COG
- CPA / TCPA
- Latitude and Longitude
- Note that the AIS data comes before the RADAR TARGET information.

By means of the More Info function, available in the Targets Data Window, more details can be visualised (Para.5.24).

As mentioned above, the Target Data Message is refreshed within the scheduled rate, according to the ship's operation. If message is not received within 6 times the scheduled time, the target will be classified as lost and an alarm will be given. The target will remain on the PPI in this condition for 1 minute, after which it will automatically be cancelled, if not acknowledged.

The operator will just need to switch the AIS Symbols to Off, if he wants to remove all displayed AIS symbols on the PPI. Anyway, the CPA / TCPA and all the anti-collision avoidance controls are always computed (refer to "Graphic Symbol Menu" Window, Figure 5.23.1).

NOTE

CPA and TCPA are calculated also for SAR (Search and Rescue) but they should be taken only as information. SAR vehicles, helicopters and airplanes being at different altitudes should not be dangerous to Own Ship.

It is possible to select Own Ship (always identified as target NR. 1), by means of the AIS List (Figure 5.18). In the Targets Data window, the fields related to speed, bearing, CPA and TCPA are obviously empty. But Own Ship's data visualisation is useful in order to see if own AIS is operating correctly. Note that Own Ship heading data comes from the gyro and not from the AIS. The reason is to avoid errors when the speed is very low.

Operating with low Range Scale (lower than 2 NM) and with ships bigger than 24 Pixels, the visualisation on the PPI is no longer a triangle, but the ship's profile, according to the static data received from AIS. Both the AIS sensor position and the heading and speed vector starting position will be visualised.

The AIS position is often different from the antenna Radar position and from the conning position, therefore it is important to establish the "Common Reference Point". In our System, the PPI centre is the position of the radar antenna, but Own Ship's vector starts from the conning. Range, bearing and CPA / TCPA of RADAR TARGET and AIS target are always referred to the Radar antenna position. During the setup phase, the position of the AIS sensor and the antenna Radar. The System can be set to refer the GPS data to the radar antenna position, and vice versa (and forward these data to the other ships). If AIS is installed, Own Ship dimensions are picked up from the AIS messages.

5.1.4.3 AIS ship outline viewing conditions

For it to be possible to view the outline of the AIS target, the following conditions must be met:

1. The ship's profile must be present, viewed on the PPI.
2. The target heading is necessary.
3. Information such as the beam and length of the ship is needed.
4. AIS Conning Position coordinates are required.
5. It is not possible to draw an outline for targets such as ATON or SAR.
6. The width of the target (represented) must be no less than four mm.
7. Speed information (SOG and COG) must be available.
8. The AIS target must not be Lost.
9. The AIS target must be active.

5.2 TARGET OVERLOAD

A target overload is signalled in OwnShip window in two small labels. For AIS and Radar targets the label background turns yellow when 95% of the maximum number of symbols is reached (190 for AIS and 38 for Radar Targets).

For Radar targets it is still possible to acquire targets until a target overflow is presented with a red background and a warning, which signals that no other acquisitions are possible until a target is lost or has been cancelled.

For AIS targets, the label turns red when the sum of sleeping and activated AIS targets reach the maximum allowed.

During AIS overflow, a mechanism of priority starts to work to select which target should be presented according to different strategies that are user selectable (see [AIS Limits Priority](#)).

5.3 RADAR TARGET TRAILS

Trails are artificial afterglow of the Radar image on the PPI, created by maintaining the echo intensity once it has been seen, and then gradually reducing the intensity, scan by scan. Target Trails may be shown in blue tone, instead of the normal video color (usually yellow). Gradual shading paints the Trails, getting thinner over time just like the afterglow on an old CRT type radar.



Figure 5.3 Radar Target Trails

Pressing the RT / TT shortcut permits to change from RT Relative Trails to TT True Trails or vice versa.

Pressing the Trails button, a list will open with the following selections:

- Trails Off.
- Trails 6 seconds.
- Trails 12 seconds.
- Trails 30 seconds.
- Trails 1.0 minutes.
- Trails 1.5 minutes.
- Trails 2 minutes.
- Trails 4 minutes.

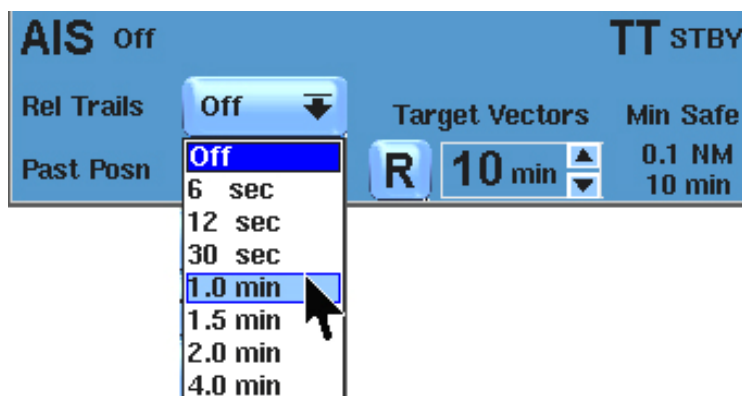
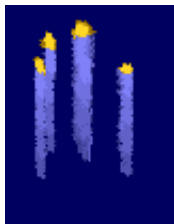


Figure 5.3.1 Trails Off

The selection indicates the time for the trails to fade out.



The picture on the left shows four targets moving in North direction, the lighter blue represent the trails. The lower intensity of the color, the longer time since the target was in that position. The Trails are always processed, even if the operator decides not to display them. The system will not cancel any trail processing even when the operator changes the range scale, the True/Relative Motion display, or if a presentation reset is done. Once the operator chooses to display the Trails, True or Relative, the calculated trails will immediately appear on the screen. Trails processing is interrupted and cancelled only if the operator changes the range scale repeatedly quicker than the time it takes the Antenna to make a complete rotation, or if the Orientation Mode is changed.

CAUTION

Trails build-up starts when exiting from the standby condition. Trails or past position length will be reached only after the selected time duration.

5.4 PAST POSITIONS

The Past Positions button function (Figure 5.4- Figure 2.3.2- Figure 2.4.2) is to visualise the last four positions of each target. Pressing the button, a list will be opened, as in the figure on the left. The dots behind the target represent its position in the past multiple of “t” time, where “t” is the time interval selected from the list shown in the figure below.

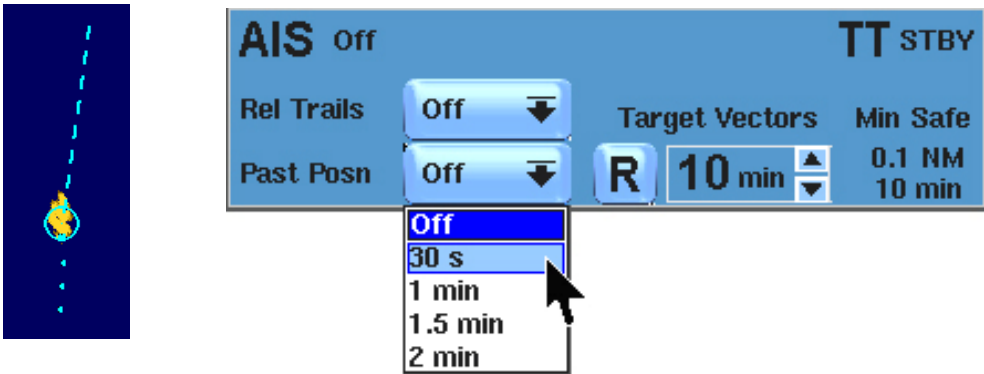


Figure 5.4 Past Position

This function is used to determine whether the target is manoeuvring or keeping a steady course. The path is displayed with up to 4 dots, spaced with a time interval defined by the selection in the list. True (T) past positions are visualized when in True Motion, relative past positions are visualized when in Relative Motion. “(T)” and “(R)” are indicated on the left side of the Past Position button.

The Past Positions are not visualized if the RADAR target Symbols are Off.

5.5 VECTOR TIME

The Vector Time label (Figure 5.5) allows setting the length of the vector drawn from the bow of each target. The Vector lengths are computed multiplying the target speed by this time value; therefore, the length of the vector, represents the echo position according to the set minute's value. The line of the vector is dashed.

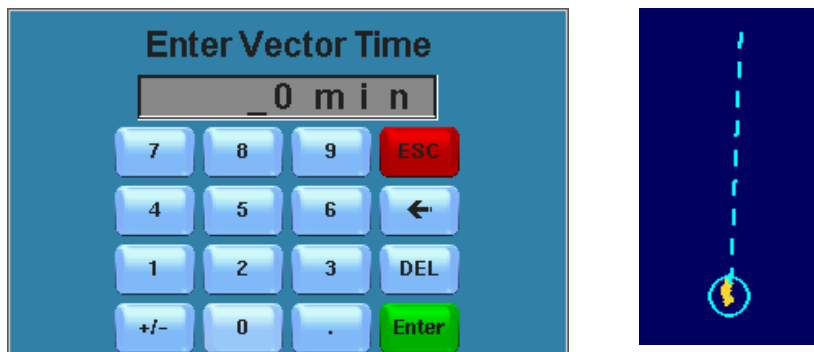


Figure 5.5 Vector Time

Placing the trackball cursor over the label, the help line will change to “Decrease”, “Enter Value” and “Increase”; therefore, using the left and right SKs the operator will change the value of a unit for each click. Pressing the centre key, the alpha numerical keyboard will be visualised to directly enter a new value. The vectors could indicate the True or the Relative speed. The selection is performed by means of the True / Relative Vector button, placed below the Vector Time label. The Vectors are not visualized if the RADAR TARGET Symbols are Off.

5.6 TRUE / RELATIVE VECTOR

The True / Relative Vector button function (parag 3.2.6 and parag.3.2.5) is to toggle the visualization of the vectors on the PPI between True and Relative speed. Toggling to True Vector is not possible in case of Gyro or Speed Log failure. If the vectors are in True presentation mode and one of the sensors (gyro or speed log) fails, the presentation is automatically switched to Relative.

5.7 TRACKING MENU

In the Tracking Menu, special features regarding Radar targets only, AIS only or both of them are found (see Figure 5.7.1):

- **RADAR Target only operations:**

- . Anchor Watch (Para. 5.8)
- . Training Target (Para. 5.9)
- . Cancel All TGT (Para. 5.10)
- . RADAR TARGET List (Para. 5.19)

- **RADAR Target and AIS Operations:**

- . Minimum Safety Menu (Para. 5.11)
- . Auto-Acquisition Zone (Para. 5.12)
- . Guard Zone (Para. 5.13)
- . Trial Manoeuvre (Para. 5.14)
- . AIS and Radar Target Association (Para. 5.16)

- **AIS only Operations:**

- . AIS On/Off (Para. 5.17)
- . AIS List (Para. 5.18)

- **AIS Limit Priority and AIS Filtering**

- . AIS Limit Priority (Para. 5.20)
- . AIS Filtering (Para. 5.21)

- **AIS options**

- . AIS Lost Target (Para. 5.22)
- . AIS Danger Target Auto activation (Para. 5.22)

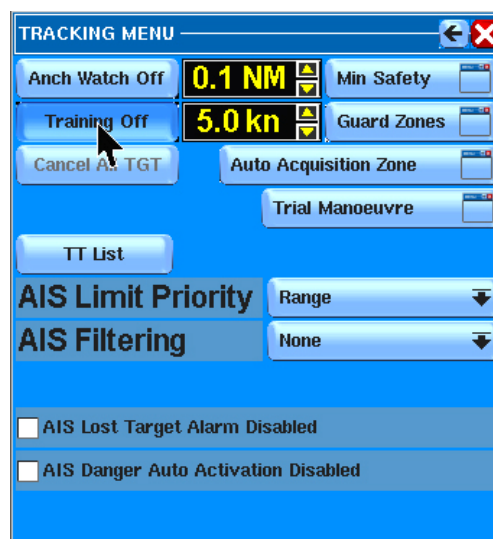


Figure 5.7.1 Tracking Menu

5.8 ANCHOR WATCH

The Anchor Watch is a Radar Target only function, and it can be used when Own Ship is at anchor and it's needed to monitor if it moves excessively from its original position.

To activate the function, proceed as follows:

1. Acquire a completely stationary echo (i.e. a buoy).
2. Select it and press "Anchor Watch Off" and the symbol will change to  with a flashing square around (selection) and the button will say "Anchor Watch On".
3. Placing the cursor on top of the label next to the Anchor Watch button, the help line will give suggestions on how to change the Anchor Watch Range, which can be changed between 0.1 and 1 NM.

With this function activated and correctly set, the system will give an alarm (visible and also audible if the audio is activated) if Own Ship moves outside the radius of the set maximum range from its original position.

5.9 TRAINING TARGET

This function can be used to train the operator on manual radar target acquisition, selection and tracking procedures, furthermore, it is a reliable tool to test the tracking facilities.

To activate this function, set the Training button to ON and a simulated target will be shown as a small "x". The training target speed can be changed by means of the SKs placing the cursor on top of the label next to the Training On / Off button.

The target starting position is 6 NM with a CPA of 0.5 NM and the TCPA depends on the speed of own ship and the training target speed. Note that the training target speed is imposed only at simulation start-up (it has no effect if it is changed with the Training already on).

Activating the function, a big symbol "X" flashing at the lower part of the PPI warns that the training simulation is running. From now on, the operator can perform all the tracking operations on the synthetic target (small "x"). Once the target has been acquired, the operator should check that the characteristics of the target are:

- Speed = as set in the related field (True Speed) with a course of 180 degrees relative to the course of Own Ship.
- CPA = 0.5 NM

To disable the simulation, switch the Training button to OFF.

The CPA and TCPA of the training target is automatically tested for accuracy by the system.

When the CPA becomes less than 0.25 NM or more than 0.75 NM, an alarm "Training Tgt CPA Out of

Range” is displayed.

When the absolute difference between measured TCPA and calculated TCPA is more than 30 sec, an alarm “Training Tgt TCPA Out of Range” is displayed.

5.10 CANCEL ALL TGT

This is a Radar Target only function, which allows the operator to cancel all acquired targets. Once pressed, a new window will be displayed, asking to confirm target deletion or not. If the operator presses “YES”, all the targets will be cancelled from the system. Otherwise no action is taken.

5.11 MINIMUM SAFETY MENU

This is a function for Radar targets and AIS, which allows visualising and setting the threshold of CPA and TCPA that defines when a target will be considered dangerous.

If for example, the values are set to 0.1 NM and 10 minutes (default values, re-set at every start-up), when a target has a CPA of less than 0.1 NM and at the same time a TCPA of less than 10 minutes, the “Danger Target Alarm” will be visualised. And if the audio is on, an audible alarm will sound as well. Also the symbol of the target will change to a triangle and it will flash in red color until the alarm is acknowledged by the operator.

5.12 AUTO-ACQUISITION ZONE

This is a Radar Target and AIS function, which allows automatic acquisition of all the echoes from Radar and AIS targets entering in a zone drawn around own ship. The Auto Acquisition Zone is not stabilised, but always linked to Own Ship’s heading and it rotates according to the heading movement (Figure 2.3.1). Pressing the “Autoacq Zone” button, the following window will be visualised in the Displaying Information Area (Figure 5.12.1).

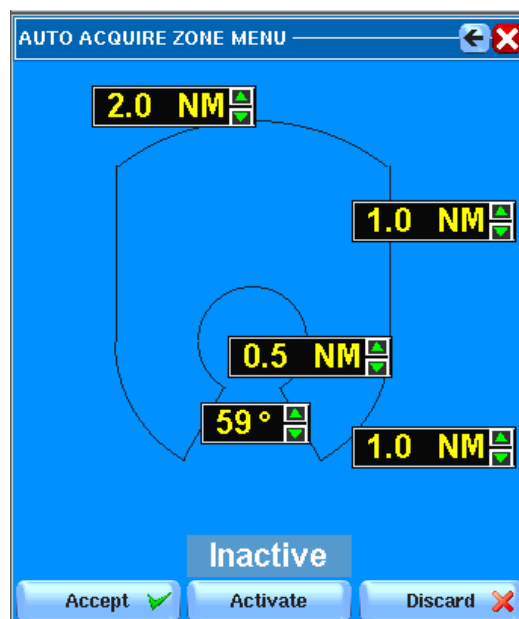


Figure 5.12.1 The Auto Acquisition Zone Menu – Detail

At the same time, the shape of the Auto Acquisition Area (the same drawn in the window in Figure 5.12.1) will be drawn on the PPI in green color with dashed lines. There are 5 adjustable values:

- Front Range; the distance from the centre to the farther front point, or radius of the frontal arc
- Width; the distance from the centre to the farther left or right point; note that the area is symmetric respect to its longitudinal axis
- Internal Range; radius of the internal blank range. This value should be adjusted in order to exclude the sea clutter
- Back Range; radius of the back range
- Back Sector; angle in degrees of the back blind sector. This value should be adjusted to exclude Own Ship wake or blind sector artefacts.

These values can be changed by means of the “+” and “-” buttons, to reach the desired proportions of the shape. Obviously, some values are limited by others, for example the width cannot be bigger than the front or back range, and the back range is limited to the back sector width.

Once the area on the PPI is drawn as desired, the Auto Acquisition Zone must be activated (by means of the “Activate” button) and the “Accept” button must be pressed to store the zone in the Tracking program.

At this point, any Radar echo or AIS target detected near the same position for 3 consecutive scans within the Auto Acquisition Zone will automatically be acquired and the alarm “RADAR TRACKED TARGET AUTO ACQUIRED” or “AIS TARGET AUTO ACQUIRED” is activated. The target symbols are visualised in para. 5.1.4 (Tracked target Symbol) (AIS Target).

Note that the “ACCEPT” button and the “X” window execute the same function.

5.13 GUARD ZONES / AUTO ACQUISITION ZONES

The Guard Zone is a Radar Target and AIS function for generating a warning when a target passes through an area. That area is called Guard Zone or Guard Ring, due to the fact that it's similar to a sector of a ring, it is geometrically the intersection between two concentric circular sectors, centred on Own Ship position. The farther side area can be from 0.4 NM to 24 NM and a thickness of 0.5 NM. The angle of the sector cannot be lower than 5° and more that 359°.

The type of zone can be switched between “Guard zone” and “Auto Acquisition Zone” (see figure Figure 5.13)

When Auto Acquisition is chosen, it's drawn in green color and it has the same behaviour of the ones described in the previous sub-paragraph.

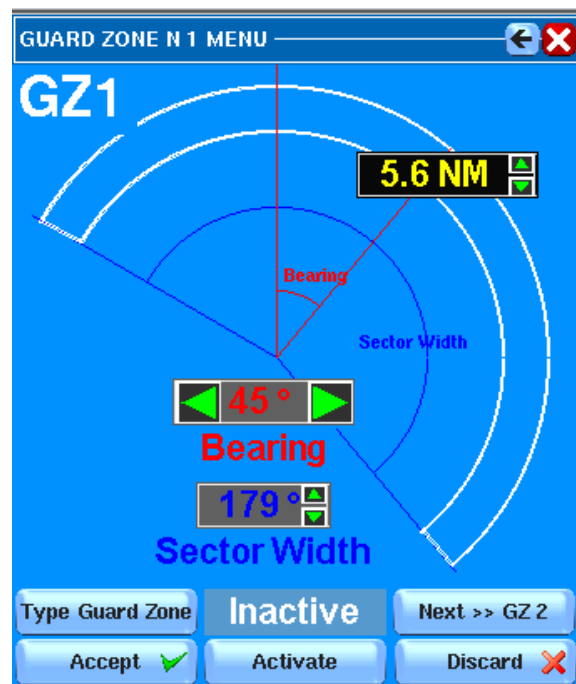


Figure 5.13 The Guard Zone Window – Detail

When Guard zone is chosen, any radar echo or AIS target received near the same position for 3 consecutive scans within the area, will automatically be acquired and, in the Alarm Area, the alarms “RADAR TRACKED TARGET AUTO ACQUIRED” and “TARGET IN GUARD ZONE” are activated and the symbol is drawn in red color as a reversed triangle (Figure 5.13, only RADAR TARGET). The main differences with the Auto Acquisition are:

1. The symbols change back into their original shape and color once they are out of the area again.
2. The alarm “TARGET IN GUARD ZONE” is given, even if the target has already previously been acquired.

The System provides up to four Guard Zones; when the “Guard Zone” button is pressed and the related window is visualised, the default Guard Ring N°1 is visualised as well. The operator will, by means of the button “Next >> GZ 1/2/3/4”, be able to select one of the other Guard Zones. Until they are in editing mode, they are drawn with a dashed line. The color of the line depends on the type: green for Auto Acquisition and red for Guard. Once they are accepted, the active ones are drawn with a standard line. The others are cancelled from the screen.

If a zone, during editing, overlaps an active zone, it will be flashing. And if the operator presses the “Accept” button, the operation will be stopped and a warning saying “Sector Overlapping” will appear in the Warnings and Wrong Orders section (Figure 7.1, 2nd column, yellow button).

The variable values are:

- Front Range

- Bearing; the bisecting imaginary line of the sector is placed at the given value, relative to the ship's heading
- Sector Width.

The procedures to activate and store the zones are the same as the Auto Acquisition zones.

The Guard Zones and Auto Acquisition Zones colors and visualisations are displayed in the following Table 5.13.1.

Table 5.13.1 - Guard Zone and Auto Acquisition Zone: color and visualisation

ZONE	COLOR	VISUALISATION
Guard Zone	Red	Activated: continuous Not Activated: dashed
Auto Acquisition	Green	Activated: continuous Not Activated: dashed
Superimposition	Blanking	Depending on the activation

It is not allowed to superimpose Guard Zone and Auto Acquisition Zone.

5.14 TRIAL MANOEUVRE

The Trial Manoeuvre is a RADAR TARGET and AIS function which is composed by cinematic simulations, provided as a rapid aid to evaluate collision risks as a result of possible course changes. To obtain realistic results, the ship's turn delay and the time required for evaluation and decision, are taken into consideration by means of a delay that can be manually inserted.

The Trial Manoeuvre functions allow course changes of up to $\pm 135^\circ$ from the original course, to be tested. To warn the operator that data displayed are not related to the actual situation, any time the Trial Manoeuvre is in use:

- a large "T" symbol is displayed on the lower part of the PPI
- on Own Ship Section the word TRIAL follows the gyro value, highlighted in red color (Figure 5.15.4)
- The Alarms button (Figure 7.1, second column, red button) will be displayed, and it will say "TRIAL EXECUTED" in red background (Figure 5.15.5).

NOTE

If at the beginning of the Trial Manoeuvre, the "Delay Time" is set higher than the lower TCPA of dangerous targets, the "WRONG: Delay Time Too Long" message will be visualised in the Warnings and Wrong Orders section (Figure 7.1, 2nd column, yellow button) and the manoeuvre is not executed.

The simulation of a possible manoeuvre is processed as follows:

- Own Ship moves along its original course with its original speed for the time set in the “Delay Time” field
- If no course change has been requested, the simulation ends after the time-out. It is not possible to set the ROT field to zero to force a steady course
- If a course change has been requested, Own Ship turns toward the course set in the “Trail Course” box and its speed is the final speed. The turn is done by using the specified rate of turn
- Then the ship is stopped and the final manoeuvre data is calculated and displayed.

ADVISORY NOTE

Trial manoeuvre result is more clearly evaluated when the presentation is on Relative Motion. More accurate estimations are made when the speed source is sea stabilised.

The Trial Manoeuvre can be performed in Manual or Automatic mode. In Manual mode the final course must be manually entered by the operator, in Automatic mode the final course is computed by the system to reach the fastest way out of a dangerous situation.

5.15 MANUAL TRAIL MANOEUVRE

The Manual Trial Manoeuvre is intended to be used in situations, where a course or speed change is foreseen, and the new course must be tested for potentially dangerous targets. The Manual Trial Manoeuvre shall not be used if the situation is already dangerous.

In order to perform the Manual Trial Manoeuvre, the operator must fill in the data related to the final Course and Speed (Figure 5.15.1). Normally the ROT, and Delay Time assume the default values, set according to ship's type, tonnage, etc. The operator can assume or change these values.

The following steps must be performed to operate with the Manual Trial Manoeuvre:

1. Press the “Trial Manoeuvre” button (Figure 5.7.1) to open the Trial Manoeuvre Menu (Figure 5.15.1).
2. If the first button on the top left part of the menu is labelled “Trial Auto”, press it to set the mode to Manual.
3. Set the desired final course by placing the cursor on the relevant label, watching the help line and using the SKs.
4. Follow the same procedure to set the desired trial speed, the ROT and the delay to the beginning of the manoeuvre; for the delay value, take care of the possible delay time Own Ship needs to reach the trial speed and to start steering.

5. Press and hold the “Trial Exec” button and the manoeuvre will be computed.

During the trial manoeuvre the time figure increases, and when the trial is completed, the alarm “Trial Executed” is displayed in the Alarms Area.

In the lower part of the menu, it is possible to check out the values of CPA and TCPA of targets selected, which, during and at the end of the computing are the calculated values from the manoeuvre. With the “Trial Exec” button released the real actual values are displayed. In case one of them is dangerous, the correspondent label is highlighted in red color.

The Minimum Safety can be set changing the “Minimum CPA” and Minimum “TCPA” values in the Trail Manoeuvre Menu, note that those values are the ones used for the minimum safety of the real navigation.

The ship will turn with the new data and after the execution time (this time take into account the delay that the ship requires to start the evasive manoeuvre or the time necessary to stop the ship, when the TRIAL SPEED has been set to 0 knots):

- Operating in True Motion, Own Ship vector will be displayed with the trial course, and at the estimated position, where the manoeuvre ends. Otherwise it is always placed at the Centre
- All targets and their vectors will be displayed on the PPI at their estimated position, according to the trial manoeuvre end, thus allowing the situation to be evaluated
- If any of the tracked targets is dangerous at the trial course, their vectors will flash in red color and the Danger Target alarm will be visualised in the Alarms Area
- The HDG, Course and Speed data displayed in OWN SHIP Section (Figure 2.3.2), are replaced by the trial speed and course data (during the simulation, until “Trial Exec” is released)
- If a set trial course is more than 135° away from the actual one, or the initial speed is 0 or invalid, the message “WRONG: Trial Not Possible” is visualised in the Wrong Orders Area.

All the vectors will be drawn consequently to the True or Relative Vectors presentation chosen.

5.15.1 Automatic Trial Manoeuvre

The Automatic Trial Manoeuvre is intended to be used in situations, where one or more targets are potentially dangerous, and own ship must assume a safe course with least possible alteration from the present one. All targets in tracking are taken into consideration searching for the safe course. Note that if no target is in risk of collision and the operator order an Automatic Trial Manoeuvre, the system will confirm the actual course and nothing will change.

The following steps must be performed to operate with the Automatic Trial Manoeuvre:

1. Press the “Trial Manoeuvre” button (Figure 5.7.1) to open the Trial Manoeuvre Menu (Figure 5.15.1).
2. If the first button on the top left part of the menu is labelled “Trial Manual”, press it to set the mode to Automatic.

3. Choose the retained better side to do the manoeuvre (Port or Starboard, the course does not have to be set).
4. Set the desired trial speed, placing the cursor on the relevant label, watching the help line and using the SKs.
5. Follow the same procedure to set the desired ROT and the delay to the beginning of the manoeuvre. For the delay value, take care of the possible delay time Own Ship needs to reach the trial speed and to start steering.
6. Press and hold the "Trial Exec" button and the manoeuvre will be computed.

If, during the manoeuvre, one or more targets are closer than the Safe range (if the Trial Manoeuvre gets too near to targets), the manoeuvre will be interrupted and the "Danger Target" alarm will be visualised in the System Data Area, Alarms Section (Figure 2.3.2) and the Manoeuvre is not executed.

The following is as using the Manual Trial Manoeuvre:

During the trial manoeuvre the time figure increases and when the trial is completed, the alarm "Trial Executed" is displayed in the Alarms Area.

In the lower part of the menu it is possible to check out the values of CPA and TCPA of targets selected, which, during and at the end of the computing, are the calculated values from the manoeuvre. With the "Trial Exec" button released, the real actual values are displayed. In case one of them is dangerous, the correspondent label is highlighted in red color.

The Minimum Safety can be set changing the "Minimum CPA" and Minimum "TCPA" values in the Trail Manoeuvre Menu (shortcuts to the real values). At the end of the Automatic Trial Manoeuvre:

- If during the manoeuvre any target is dangerous, the manoeuvre will continue
- Own Ship vector will be displayed with the computed safe trial course, and at the estimated position, where the manoeuvre ends
- All target vectors on the PPI are displayed at their estimated position, according to the trial manoeuvre end, thus allowing the situation to be evaluated
- The calculated safe course and HDG are displayed in Own Ship Section of the System Data Area (Figure 2.3.2).

If, at the beginning of the trial manoeuvre, one or more targets have TCPA less than the trial delay time, the "WRONG: Delay Time Too Long" message will be visualised in the System Data Area, Alarms Section (Figure 2.3.2).

If the Automatic Trial Manoeuvre gets an unsuccessful result, the operator can:

- Modify the minimum safety limits (if they are, for instance too high, the manoeuvre fails), and assume some others more realistic.
- Decrease the Delay Time and/or increase the ROT.

If the Automatic Trial Manoeuvre again is unsuccessful, the operator can vary the speed.

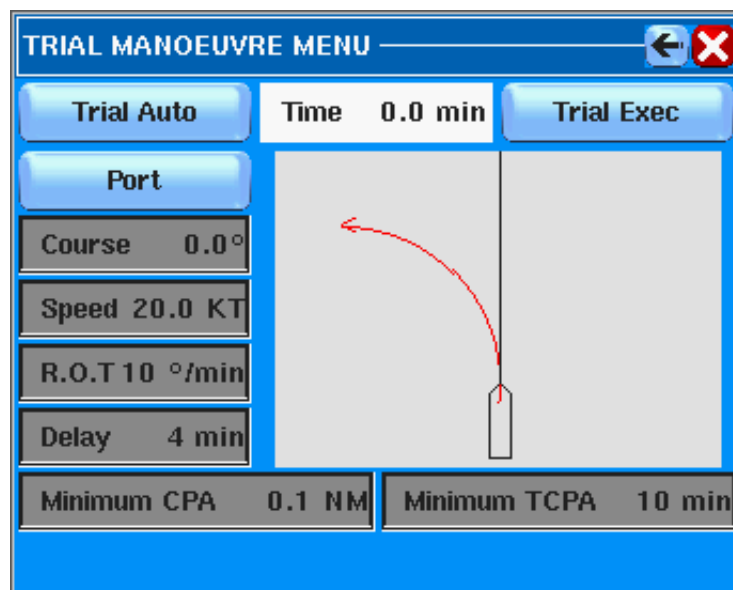


Figure 5.15.1 Trial Manoeuvre Window - Before the execution - Detail



Figure 5.15.2 The target 3 is dangerous and an Automatic Trial Manoeuvre is needed.

The real CPA and TCPA of the target 3 (selected) are shown in the lower part of the Trail Manoeuvre Menu (red background because dangerous).

ARGUS RADAR

Tracking

At manoeuvre executed, the target 3 is not dangerous anymore, this means that the manoeuvre can be performed.

The CPA and TCPA of the selected target 3 are not in red background anymore, and as such not dangerous. The flashing "T" on the left side of the values stands for "Trial Values".



Figure 5.15.3 Automatic Trial Manoeuvre scenario – Before and after the execution

ARGUS RADAR

Tracking

The operator needs to understand if a steering to 0° is safe, so he performs the Manual Trial Manoeuvre to foresee the situation at the end of the steering he intends to do.

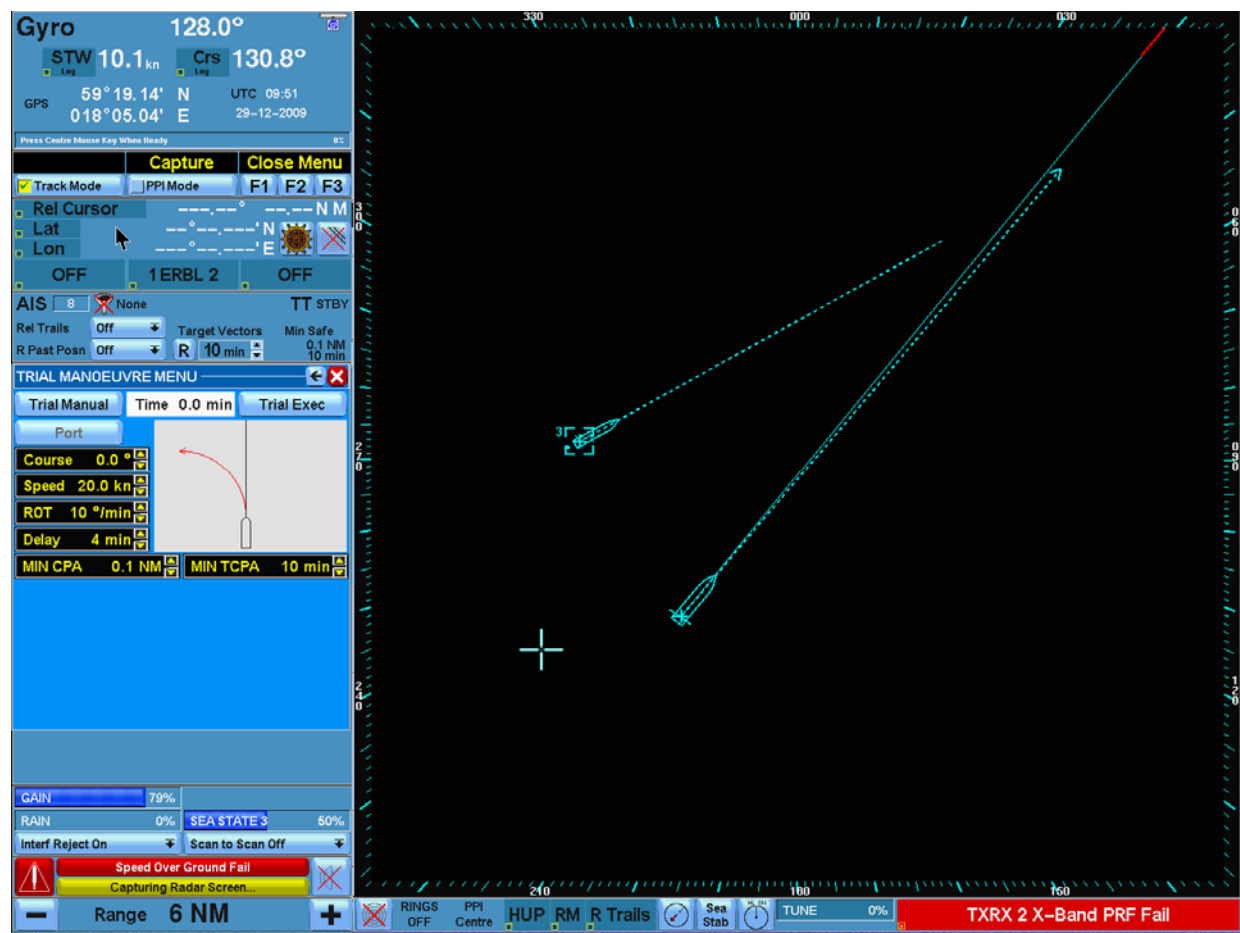


Figure 5.15.4 Automatic Trial Manoeuvre scenario

ARGUS RADAR

Tracking

During and at the end of the manoeuvre the target 3 is not dangerous, and Own Ship seems to safely cross the Bow of target 3, with a CPA of 0.3 NM



Figure 5.15.5 Manual Trial Manoeuvre scenario - After the execution

5.16 AIS AND RADAR TARGET ASSOCIATION

The system can visualize up to 40 Radar Tracked targets and 200 AIS Targets (The closer to own ship among the 500 that potentially the System can elaborate).

It is possible to merge a Radar target and an AIS target retaining the same ship, in order to:

- reduce an excessive number of symbols and targets presentation, that could result in some dangerous confusion

and

- compensate for a possible failure if one of the two targets (for instance, if the Radar Tracked target falls behind an island, the system keeps on tracking and visualizing the AIS target).

This facility is called AIS / Radar target Association.

In practice, when an echo with its AIS symbol on top is being acquired for tracking, the system can detect that the two symbols represent the same target. The symbol displayed after the association is only the AIS one, but the Radar tracked target continues to be analyzed by the tracking program as well.

Only by means of the selection of the target is possible to determinate if it is merged with a Radar target.

NOTE

The AIS is used during target association to help the tracking process in identifying possible dangerous situations like target swap, manoeuvre and to provide a stable source of position when the echo is fading from scan to scan.

The option to merge the two tracks can be selected by the operator, pressing the button "AIS / TT Association" in the "Tracking Menu" (Figure 5.7.1), the "Tracking Data Association Menu" will be displayed.

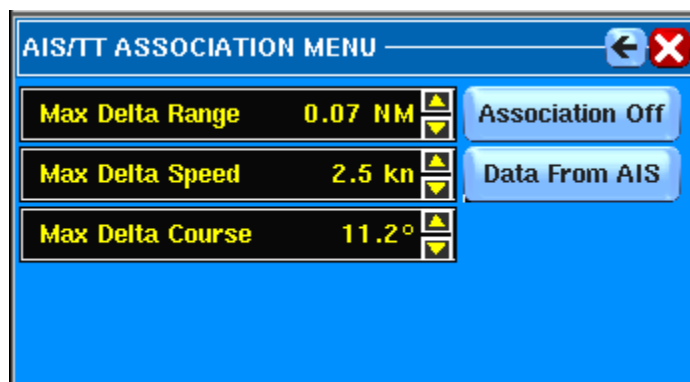


Figure 5.16 Tracking Data Association Menu

In order to properly operate with Tracking Data Association, the operator has to fill in three values in the above window (Figure 5.16):

- Max Delta Range (0.07 NM in the Figure).
- Max Delta Speed (2.5 KT in the Figure).
- Max Delta Course (11.2° in the Figure).

The Association between two tracks will occur only when:

- The Data Association is ON.
- The RADAR Tracked target is steady.
- The distance between them is less than the set Max Delta Range, the difference between their speed is lower than the set Max Delta Speed, and the difference between their course is less than the set Max Delta Course.

The Association is not possible when and if:

- just one of the above conditions is not realized.
- the AIS Target has an invalid course and / or speed information (Gyro and/or Log Failure).

In case two targets were incorrectly fused, the two targets will be split again and the RADAR Tracked target will be drawn with its original symbol again, once one of the above conditions has changed.

NOTE

If more than one RADAR Tracked target is in the above mentioned thresholds, only the closer one will be fused.

The Data From the AIS button is used to change the source of data presented on the target data window when a fused target is selected.

A symbol will be displayed in the lower part of Own Ship window indicating the data origin, the same symbol is drawn for the fused target with  for TT data and  for AIS data.

5.17 AIS ON / OFF

This button toggles the AIS interface On or Off. Switching it off, all the AIS NMEA sentences received will not be processed and all the actually displayed ones will be cancelled.

This button should be used to disable the AIS function when no AIS input is available.

5.18 AIS LIST

Pressing the “AIS List” labelled button, the “AIS List Menu” will be displayed. This window lists all the AIS targets being processed (max 100) and the list can be sorted by range, ship name or id number.

NOTE

Targets will be given an ID number in the order they are received. Switching the AIS interface off and on again, or looking at another Radar display, this number can therefore be different for the same target.



Id	Ship Name	Range
01	HOMER J SIMPSON (OS)	0.0 NM
02	BART SIMPSON	2.7 NM
03	MARGE SIMPSON	1.6 NM
04	BARNEY GUMBLE	24.8 NM
05	KRUSTY THE CLOWN	21.4 NM
06	CHIEF WIGGUM	6.2 NM
07	MONT. BURNS	17.7 NM
08	SIDESHOW BOB	23.1 NM
09	ITCHY	12.8 NM
10	SCHRATCHY	19.5 NM
11	FREDDIEFLIGHTCAPTAIN	14.6 NM
12	MOE	0.7 NM
13	LISA SIMPSON	4.1 NM

Figure 5.18 AIS LIST

Selecting the items of the list, the correspondent target will be selected. And closing the list, the Targets Data Window will be displayed. This means that it is possible to select more than one item from this list.

The AIS List is a tool where the operator can take a quick look at the AIS situation around Own Ship, and it can list targets farther than the maximum range scale of the Radar. It is useful for searching a ship by its name and select it, so that it will be “highlighted” by the selected symbol on the PPI.

5.19 TT TARGET LIST

Pressing the “RADAR TARGET List” labelled button, the “RADAR TARGET List Menu” will be displayed. This menu has exactly the same purpose as the AIS List; it lists all the RADAR Tracked targets being tracked and the list can be sorted by range, dangerousness or id number.

RADAR TARGETS SELECTION LIST					
Id	Safety				Range
01	CPA	4.5 NM	TCPA	100 min	6.0 NM
02	CPA	5.1 NM	TCPA	100 min	6.0 NM
03	CPA	5.6 NM	TCPA	100 min	6.0 NM
04	CPA	5.9 NM	TCPA	100 min	6.0 NM
05	CPA	6.0 NM	TCPA	100 min	6.0 NM
06	CPA	5.9 NM	TCPA	100 min	6.0 NM
07	CPA	5.6 NM	TCPA	-100 min	6.0 NM
08	CPA	5.2 NM	TCPA	100 min	6.0 NM
09	CPA	4.6 NM	TCPA	100 min	6.0 NM
10	CPA	3.9 NM	TCPA	100 min	6.0 NM

Figure 5.19 TT TARGET LIST

NOTE

RADAR Tracked targets will be given an ID number in the order they are received. Switching off and on the system, or looking at another Radar display, this number can therefore be different for the same target.

5.20 AIS LIMIT PRIORITY

The number of targets that can be processed and visualized is 200. The AIS Limit Priority button function is used to set the priority mode which will discard the AIS targets exceeding the 200. It is possible to set the priority by:

- **RANGE** Only the ones closest to own ship will be accepted.
- **DANGER** Only the most dangerous will be accepted. Danger is evaluated according a weighted combination of CPA / TCPA and relative speed.

5.21 AIS FILTERING

The AIS Filtering function is used to filter the number of AIS targets displayed. This function can be useful to avoid any possible confusion caused by the excessive number of targets visualized. It's important to note that even if AIS targets visualization is filtered, all the targets received (even the hidden ones) will continue to be processed and analyzed. For example, if an AIS target is not visualized, but it becomes dangerous, it will appear instantly on the PPI area. The filter operates on the total AIS targets counter and the relative maximum capacity alarm.

It is possible to filter the visualization by:

- **RANGE** By selecting RANGE, a menu will appear requesting to select the maximum displaying range from own ship in NM. All the targets outside this range will be hidden.
- **CPA** By selecting CPA, a menu will appear requesting to select the maximum value for the CPA in NM. All the targets outside of this range will be hidden.
- **TCPA** By selecting TCPA, a menu will appear requesting to select the maximum value for the TCPA in minutes. All targets outside of this range will be hidden.
- **CLASS A** Only the AIS targets of CLASS A will be displayed.
- **CLASS B** Only the AIS targets of CLASS B will be displayed.
- **SPEED** By selecting SPEED, a menu will appear requesting to select the minimum value for any target in KT. Targets with a lower speed than this value will be hidden.

5.22 AIS OPTIONS

Two options are available if the related checkbox is enabled:

- AIS Lost Target Alarm Disabled. This is useful when AIS targets are near the limit of VHF reception, in that case the lost alarm can become annoying with the AIS symbol continuously switching from sleeping to lost state.
- AIS Danger Auto Activation Disabled. This checkbox can disable the automatic activation for AIS that becomes dangerous.

5.23 SYMBOL

Pressing the “Symbols” labelled button, the “Graphic Symbol Menu” will be displayed. This menu allows the operator to:

1. Toggle the Radar Target, AIS and Navigation symbols on/off.
2. Set up and display up to 4 parallel indexes.
3. Visualise waypoint details.
4. Set which kind of data to display on the PPI for the selected AIS targets.

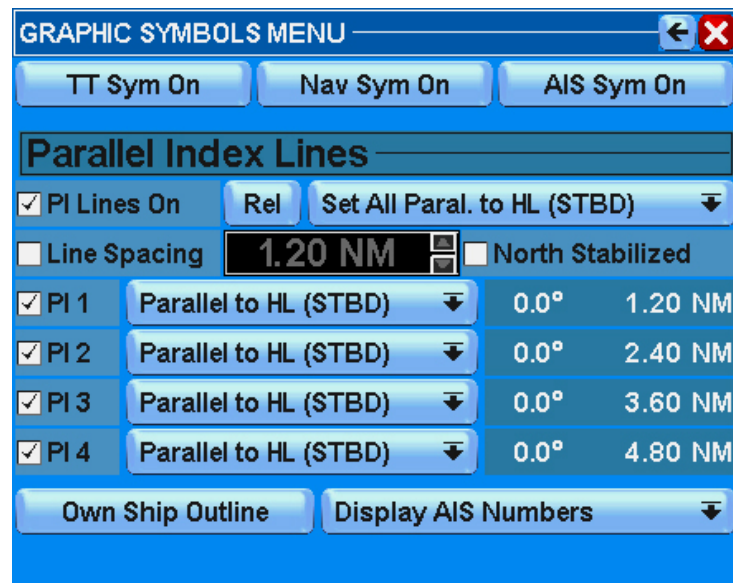


Figure 5.23.1 Graphic Symbols Menu Window

Normally all the symbols mentioned in point 1 are visible by default, but can be disabled by the operator.

5.23.1 TT, AIS and Navigation Symbols

Radar and AIS targets can be displayed in different ways, according to conditions of the target to be drawn and to the Radar presentation.

Symbol: Indicates the type and the status of the target and if it is assigned by the System. The meaning of each symbol is explained below.

ID Code: Displayed as a number from 1 to 40 for RADAR TARGET tracks and from 1 to 200 for AIS tracks. For the RADAR Tracked targets it is assigned by the system incrementally, the last one plus 1 (if under 40), even if lower numbers are free. For the AIS targets it is the lowest number available at the first reception. In both cases the number remains with the target until it is cancelled. For AIS targets there is also the possibility to display the Ship Names or the Call sign next to the ID Code (more details further ahead in this paragraph).

Vector: the direction indicates the target movements whilst the length indicates the expected displacement of the target within an interval time (Vector Time). If the target movement is slow, the vector length is a dot. It can be displayed true or relative according to the vector presentation.

Past Position: The position where the targets have been in the past, plotted for every 30 seconds or every minute, or every 2 minutes... according to the choice in the relevant field.

True Vectors are selected by pressing the True/Relative Vector button (Para. 5.6). The status is readable on the button after it has been pressed. This allows true movement of targets, and is used to evaluate the actual traffic situation. Initially, after acquisition of a Radar Tracked target, the system will not have enough data to provide a reliable vector and only the Initial State symbol will be displayed.

After approximately 1 minute, the vector will be drawn with the approximate speed and course, and after three minutes the symbol will change to the steady one and the accurate vector will be visualised.

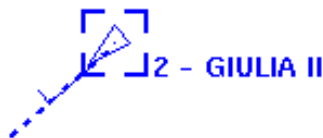
The True Vector presentation is automatically disabled if the speed source is in failure or if Manual Speed is selected.

Switching off the Radar Target symbols, all the above mentioned symbols related to Radar Target presentation will be removed from the screen, but the tracking will keep on computing. The same for the AIS symbols.

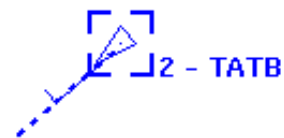
Looking at the Figure 5.23.1, the button down on the right ("Display AIS Numbers") is visualised only if the AIS is connected and switched on. Pressing it, it is possible to select to have only the ID codes or also the Ship Name or the Call Sign (of the selected AIS tracks) visible. Pressing the button, a list with the above choices will be displayed.



ID Code Only Visualised



Ship Name Visualised



Call Sign Visualised

Note: Call sign and AIS Names are displayed only for selected AIS targets. If the data is still not available for an AIS, the MMSI is shown instead.

5.23.2 Route Presentation and Waypoints Data

The system is able to display routes according to the sentences WPL and RTE. An example of a route is shown in the following figure:

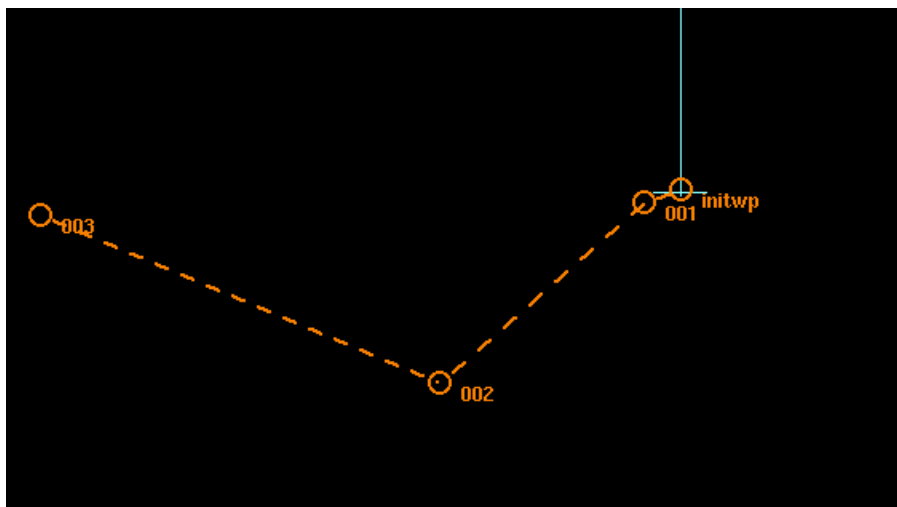


Figure 5.23.2 Example of route displayed in the PPI

The route is immediately displayed after been received from the ECDIS/EPFS and disappears automatically after a 40 seconds timeout. The route is presented according to own ship's geographic position and the range scale in use.

Inside the Symbols window, the Waypoints Data button is visible when a route has been received from EPFS. Press the button to show the "Waypoints Data Menu".

The window will display all the visible waypoints and their geographic coordinates.

5.24 DISPLAYING TARGET INFORMATION

In this Section of the System Data Area Monitor all the temporary menus, which are not part of the System Data Area, will be displayed. The most important function of this Section is to visualise all the information related to the selected Target, Radar Target or AIS (Figure 2.3.1 and Figure 5.24.1).

Once a target has been selected, the Target Data Window is visualised (Figure 5.24.1). Opening other menus, the Target Data Window will automatically be closed and the new menu will appear. To get back the Target Data Window again, the opened menu must be closed by means of the "X" button placed on the top right part of the menu. The information in the Target Data window can only be removed by cancelling the selected targets.

The Target Data Window can display up to 12 rows of data for 2 targets at a time (default) or 7 rows of data for 4 targets. AIS and Radar Target Data:

- Target ID number. In this row it is specified if the track is Radar Target or AIS, and if its status is abnormal (Lost or Danger)
- Ship Name. Available only with AIS tracks. For Radar Target the field is indicated with "---"
- MMSI (Maritime Mobile Service Identity). Available only with AIS targets. For Radar Target the field is indicated with "---"
- Call Sign. Available only with AIS targets. For Radar Target the field is labelled with "---".
- Range. Distance in NM between the target and Own Ship
- Bearing. The angle in degrees between the direction of the target and Own Ship Heading (Relative) or North (True)
- Speed. Speed in knots of the target (True) or vectorial difference between Own Ship and the target speed (Relative). Could be stabilised to ground or water, depending on the chosen speed source
- Course. The course in degrees of the target referred to North (True) or to Own Ship course (Relative). Could be stabilised to ground or water, depending on the chosen speed source
- CPA (Closest Point of Approach). Indicates the minimum possible distance foreseen, expressed in NM, between own ship and the target, computed from the known speed and

course over the last minutes

- TCPA (Time to Closest Point of Approach). Indicates the time to reach the CPA, in minutes
- Geographic Position of the target
- BCR (Bow Crossing Range). Indicates the distance in NM between Own Ship bow and the target in the moment of the crossing through Own Ship Heading
- BCT (Bow Crossing Time). Indicates the time in minutes to reach the BCR
- Destination. Indicates the actual destination of the target. The information is available only on AIS targets and must be manually updated by the operator of the ship the target refers to
- ETA. Indicates the UTC when the target will arrive at destination. The information is available only on AIS targets and must be manually updated by the operator
- ROT. Indicates the rate of turn in °/min of the target. The information is available only on AIS targets and could be unavailable if no ROT sensor is connected to the AIS transponder of the ship the target refers to
- Ship Type. Indicates what kind of ship the selected target refers to. The information is available only on AIS targets. The various possibilities are further explained later in this paragraph
- Status. Indicates the navigation status of the target. The information is available only on AIS targets. The various possibilities are further explained later in this paragraph.

The switching between the presentation of 2 and 4 targets is easily performed by means of the SKs, placing the trackball cursor in the Target Data window and looking at the Help Line. The Target Data window, Figure 5.24.1.

Tgt id	AIS 86	TT 1
Ship Name	KAZYM RIVER	---
MMSI	215058000	---
Call Sign	9HAY7	---
Range	49.71 NM	11.84 NM
R Bearing	158.6 °	2.5 °
R SPD	6.5 KT	25.2 KT
R CRS	216.3 °	220.6 °
CPA	16.7 NM	0.1 NM
TCPA	> 99.9 min	28.2 min
Lat	58°33.468' N	59°30.056' N
Lon	017°31.086' E	018°13.990' E

Figure 5.24.1 Target Data Window

Placing the trackball cursor inside it, the Help Line will change as follows. Therefore, by means of the right SK, the presentation can be switched to 4 targets mode, changing the Target Data window as shown in the following picture.

Tgt id	AIS 100		AIS 72	
Range	13.01	NM	4.17	NM
R Bearing	49.1	°	82.1	°
R SPD	12.7	K T	6.5	K T
R CRS	258.5	°	219.0	°
CPA	2.0	NM	4.2	NM
TCPA	61.0	min	5.9	min
Tgt id	AIS 86		TT 1	
Range	49.71	NM	11.46	NM
R Bearing	158.6	°	2.5	°
R SPD	6.5	K T	24.8	K T
R CRS	216.3	°	220.6	°
CPA	16.7	NM	0.1	NM
TCPA	> 99.9	min	27.8	min

Figure 5.24.2 Four Targets

Switching from 2 to 4 targets presentation, the 3rd and the 4th fields will be empty, because only 2 targets at the time could be selected so far. The above picture refers to the window after the selection of other 2 targets. The Help Line aspect will change consequently as follows, giving the possibility to return back to the 2 targets presentation just by pressing the right SK again. As shown in the Help Line pictures, in the Targets Data window the left and centre SKs have their own function as well. Pressing the centre SK, the Minimum Safety window will be displayed right under the Targets Data window. Pressing it again, the Minimum Safety window will be closed.

Tgt id	AIS 100		AIS 72	
Range	13.01	NM	4.17	NM
R Bearing	49.1	°	82.1	°
R SPD	12.7	K T	6.5	K T
R CRS	258.5	°	219.0	°
CPA	2.0	NM	4.2	NM
TCPA	61.0	min	5.9	min
Tgt id	AIS 86		TT 1	
Range	49.71	NM	11.29	NM
R Bearing	158.6	°	2.5	°
R SPD	6.5	K T	24.9	K T
R CRS	216.3	°	220.1	°
CPA	16.7	NM	0.2	NM
TCPA	> 99.9	min	27.2	min

MINIMUM SAFETY MENU		✕
CPA	0.1 NM	
TCPA	10 min	

Figure 5.24.3 Safety Menu

Pressing the left SK, a new yellow window will be displayed with the available extended data about the target related to the field of the Target Data window where the SK has been pressed. Hold the SK to keep the Extended Data window on the screen; its releasing will cause the closing of the window. With the 2 targets mode, pressing the left SK in the field of an AIS target, the Extended Data window

will appear as follows.

Tgt id	AIS 86	Ship Type:	Tanker
Ship Name	KAZYM RIVER	Status:	at Anchor
MMSI	215058000	Destination:	NOT NOMINATE
Call Sign	9HAY7	ETA:	August 18th - 16:00
Range	49.71 NM	ROT	-5 °/min
R Bearing	158.6 °	BCR:	---, - NM
R SPD	6.5 K T	BCT:	> 2 Days
R CRS	216.3 °		
CPA	16.7 NM		
TCPA	> 99.9 min		
Lat	58°33.468' N		
Lon	017°31.086' E		

Figure 5.24.4 Extended Data window

The information displayed is:

1. Type of Ship
2. Nav Status
3. Destination
4. ETA
5. ROT
6. BCR
7. BCT.

With the 2 targets mode, pressing the left SK in the field of a RADAR Tracked target, the Extended Data window will appear as follows:

Tgt id	AIS 86	TT 1
Ship Name	KAZYM RIVER	---
MMSI	215058000	---
Call Sign	9HAY7	---
Range	49.71 NM	10.08 NM
R Bearing	152.6 °	356.9 °
R SPD	6.5 K T	24.7 K T
R CRS	216.3 °	220.2 °
CPA	16.7 NM	0.2 NM
TCPA	> 99.9 min	24.5 min
Lat	BCR 0.42 NM	59°28.680' N
Lon	BCT 18.92 min	018°11.850' E

Figure 5.24.5 Extended Data window

The information displayed is:

1. Bow Crossing Range (BCR)
2. Bow Crossing Time (BCT)

With the 4 targets mode, pressing the left SK in the field of an AIS target, the Extended Data window will appear as follows.

Tgt id	Ship Name: KAZYM RIVER	
Range	Ship Type: Tanker	
R Bearing	Status: at Anchor	
R SPD	Destination: NOT NOMINATE	
R CRS	ETA: August 18th - 16:00	
CPA		
TCPA		
Tgt id	AIS 86	MMSI 215058000
Range	49.71 NM	Call Sign 9HAY7
R Bearing	158.6 °	Lat 58°33.468'N
R SPD	6.5 K T	Lon 017°31.086'E
R CRS	216.3 °	ROT -5 °/min
CPA	16.7 NM	BCR: ---, - NM
TCPA	> 99.9 m i n	BCT: > 2 Days

Figure 5.24.6 Extended Data window

The information displayed is:

1. Name of Ship
2. Type of Ship
3. Nav Status
4. Destination
5. ETA
6. MMSI
7. Call Sign
8. Latitude
9. Longitude
10. ROT
11. BCR
12. BCT.

Note that in this case, two windows are visualised around the field where the SK has been pressed.

With the 4 targets mode, pressing the left SK in the field of an AIS target, the Extended Data window will appear as follows.

Tgt id	AIS 100		AIS 72	
Range	13.01	NM	4.17	NM
R Bearing	49.1	°	82.1	°
R SPD	12.7	K T	6.5	K T
R CRS	258.5	°	219.0	°
CPA	2.0	NM	4.2	NM
TCPA	61.0	m i n	5.9	m i n
Tgt id	AIS 86		TT 1	
Range	49.71	NM	10.92	NM
R Bearing	158.6	°	2.7	°
R SPD	Lat 59°29.333'N		24.7	K T
R CRS	Lon 018°12.863'E		218.3	°
CPA	BCR Behind		0.5	NM
TCPA	BCT 254.55 min		26.5	m i n

Figure 5.24.7 Extended Data window

The information displayed is:

1. Latitude
2. Longitude
3. ROT
4. BCR
5. BCT.

When Selecting a RADAR Tracked target, which has been acquired less than 2 minutes before (not yet steady), some fields of the Target Data window will as a result be unavailable until the expiring of the two minutes. These fields are:

- Speed.
- Course.
- CPA.
- TCPA.

Tgt id	AIS 86		TT 1	
Ship Name	KAZYM RIVER		---	
MMSI	215058000		---	
Call Sign	9HAY7		---	
Range	49.71	NM	11.84	NM
R Bearing	158.6	°	2.5	°
R SPD	6.5	K T	25.2	K T
R CRS	216.3	°	220.6	°
CPA	16.7	NM	0.1	NM
TCPA	> 99.9	m i n	28.2	m i n
Lat	58°33.468' N		59°30.056' N	
Lon	017°31.086' E		018°13.990' E	

Figure 5.24.8

The reason is that this information is computed by the Tracking program and at least 2 minutes are needed to obtain certain and reliable data.

Selecting an AIS target, normally all the data is available immediately. Only the static data, such as Ship Name, Ship Type, Call Sign, Destination, ETA, Status..., could be unavailable if the target is being selected before the detection of the static message.

When one of the selected targets is dangerous or lost, the label, normally indicating the ID number, changes its background to red, and the correspondent status is written into it. The following picture shows how the upper label of the Target Data window changes, when the target is dangerous.

Tgt id	T T1 DANGER	--
Ship Name	---	---

Figure 5.24.9 Danger targets label

In case of lost target, the “DANGER” readout is replaced by “LOST”.

Another part of the Target Data window, which changes labels according to the situation, is the title of the bearing, the speed and the course (title does not mean the values labels). The value of the bearing could be Relative or True. The letter preceding “Bearing” changes consequently from “R” to “T”. The bearing of the selected targets changes along with the selected motion mode:

- Relative Motion  Relative Bearing
- True Motion  True Bearing.

Also the value of Speed and Course could be Relative or True, and the letter preceding them will change consequently as well. The Speed and Course of the selected targets change along with the vector presentation mode:

- True Vector  True Speed and Course
- Relative Vector  Relative Speed and Course.

Furthermore, the background of the labels will change to red color if their values are incoherent with the motion mode:

1. Relative Speed and Course and Relative Motion  standard background
2. Relative Speed and Course and True Motion  red background
3. True Speed and Course and Relative Motion  red background
4. True Speed and Course and True Motion  standard background.

ARGUS RADAR

Tracking

Tgt id	TT 1	--
Ship Name	---	---
MMSI	---	---
Call Sign	---	---
Range	4.27 NM	--- NM
R Bearing	352.8 °	--- °
R SPD	10.1 K T	--- K T
R CRS	226.1 °	--- °
CPA	0.4 NM	--- NM
TCPA	25.4 min	--- min
Lat	59°23.763' N	--°--',---' N
Lon	018°05.350' E	---°--',---' E

Rel Motion – Rel Vector

Tgt id	TT 1	--
Ship Name	---	---
MMSI	---	---
Call Sign	---	---
Range	5.29 NM	--- NM
T Bearing	77.6 °	--- °
T STW	5.0 K T	--- K T
T CRS	252.2 °	--- °
CPA	0.5 NM	--- NM
TCPA	28.1 min	--- min
Lat	59°22.207' N	--°--',---' N
Lon	018°08.982' E	---°--',---' E

True Motion – True Vector

Tgt id	TT 1	--
Ship Name	---	---
MMSI	---	---
Call Sign	---	---
Range	5.10 NM	--- NM
T Bearing	77.8 °	--- °
R SPD	11.1 K T	--- K T
R CRS	252.0 °	--- °
CPA	0.6 NM	--- NM
TCPA	27.6 min	--- min
Lat	59°22.147' N	--°--',---' N
Lon	018°08.627' E	---°--',---' E

True Motion – Rel Vector

Tgt id	TT 1	--
Ship Name	---	---
MMSI	---	---
Call Sign	---	---
Range	4.39 NM	--- NM
R Bearing	352.7 °	--- °
T STW	5.0 K T	--- K T
T CRS	216.2 °	--- °
CPA	0.3 NM	--- NM
TCPA	26.3 min	--- min
Lat	59°23.846' N	--°--',---' N
Lon	018°05.510' E	---°--',---' E

Rel Motion – True Vector

NOTE

True target data is not available if speed log is in failure or if
MANUAL SPEED is selected.

CHAPTER 6

MAPS

6.1 GENERAL

The Video Maps are navigation graphic tools, composed by lines, text and symbols, to be superimposed on the PPI. Their purpose is to help the operator to increase the definition of the coasts or restricted or dangerous areas. Each map consists of up to 120 segments, 32 texts and 32 symbols, 184 elements in total. Symbols and texts should be used to better understand what the lines and the areas represent.

The Argus display provides three kinds of Video Maps:

- Relative Map, which follows the movement of Own Ship and is always in the same position with respect to Own Ship and equally oriented in relation to Own Ship Heading. All the map coordinates are stored as distances from Own Ship.
- Dead Reckoning Map, which is relative to land and to North (where it is calculated to be), its position is calculated with Own Ship speed and course sources. All the map coordinates are stored as distances from Own Ship, so it must always be loaded in the same place, to the same heading (i.e. at mooring place).
- Geographic Map. All the map coordinates are stored as geographic positions, and once it is loaded, its elements are always drawn in the same absolute position (if EPFS is available).

NOTE

In case the EPFS or the Gyro is in Failure or Invalid, it is not possible to display Geographic Map. And in case of Log or Gyro Failure also the Dead Reckoning Map is unavailable.

Operating with the Video Maps Menu, it is possible to perform many operations, such as:

- Recall a stored Video Map
- Create a new Video Map
- Undisplay the selected Video Map
- Move the selected Video Map
- Rotate the selected Video Map.

Pressing the “Maps” button, the Video Maps Menu will show (Figure 6.1) a list of what is stored in the system maps and the three buttons, which allow the operator to perform the possible actions:

- “Create New”, to create a new map and to enter it into the Maps Editing Window
- “Open Map”, to load a map from the upper list (an item of the list must be selected). After the selection, the Map will appear on PPI and another window will be displayed

- “Delete Map”, to delete a map, which is no longer wanted (an item of the list must be selected). The system will ask to confirm the action before performing it
- “Undisplay Map”, to disable the presentation of the map displayed on the screen. The same action is available under the command “Clear Map”, when the editing menu is open.

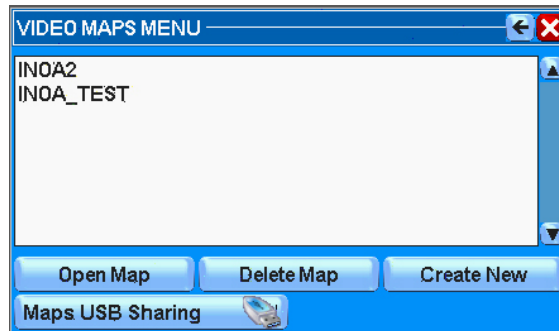


Figure 6.1 VIDEO MAPS MENU

When a map is presented on the PPI, its name is displayed in the last line of the Own Ship Window. The name also works as a command shortcut with trackball push-button functions shown on the Help line.

- “Map List” opens the Video Maps Menu
- “Hide Map” hides the map temporarily from the screen, the Help lines middle suggestion changes to “Show Map” and on the Map Name a “(Hidden)” text is added. Press the trackball middle push-button again to show the map again
- “Clear Map” is a shortcut to the “Undisplay Map” command. Used to delete the map permanently.

6.2 CREATE A NEW MAP

Pressing the “Create New” button, the “Edit Map Menu” will open. This menu provides all the facilities to manage the Video Maps and this is the same menu used to edit a stored map.

To start creating a map, the first step is to press “Start Build Map”. At the beginning, this is also the only button enabled, the other buttons and labels will be insensitive (as shown in Figure 6.2.1).

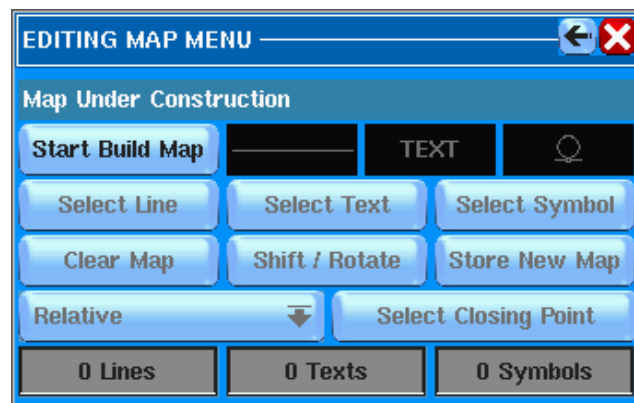


Figure 6.2.1 Editing Map Menu (1)

After “Start Build Map” has been pressed for the first time, its text changes to “Start New Line” and its function changes. The labels with black background, next to the right of this button, will also turn sensitive (Their background changes to white, when moving the cursor over them (as a kind of focusing). The purpose of these labels is to give the operator the possibility to choose the type and color of the next lines he is going to draw, the color of the next text he is going to write and the type and color of the next symbol he is going to place. Clicking inside each of them, the following windows will appear to make the choices.

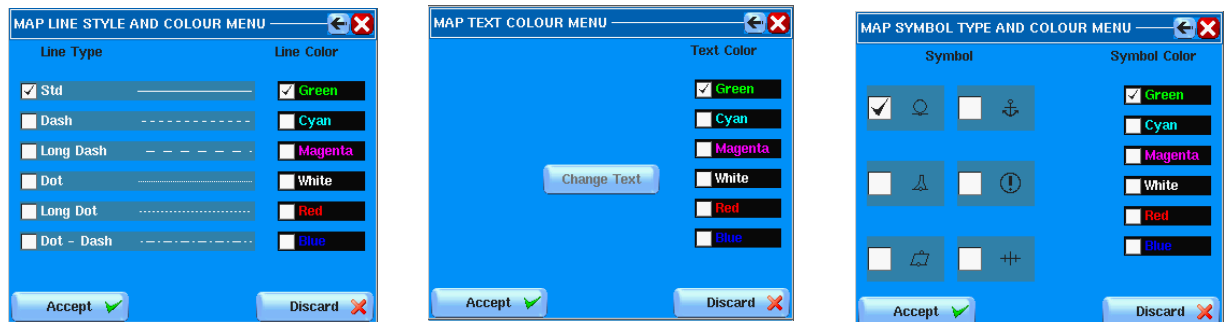


Figure 6.2.2 MAP COLOR MENU

When the trackball cursor is inside the PPI, the Help Line will change to “Ins Line”, “Ins Text” and “Ins Symbol” (“Ins” stands for Insert).

Inserting Line:

Now, pressing the left SK on the PPI, the first point of the first segment will be placed and a line will connect that point from the trackball cursor. Pressing it again at another location, a segment will be drawn with the style and the color previously defined for the lines. Another line will follow the trackball pointer from that point, so that the next point of the map will be automatically connected to the previous one. In case a multi-line segment has to be interrupted (the following point shall not be connected to the previous one), the operator has to press “Start New Line” and place the point where desired, starting the new line. At the first line inserted, the “Select Line” button will be enabled, because it is now possible to select and modify a line.

When drawing the map, it is possible to automatically close the areas. For example, drawing a square, after the 3rd line segment is drawn, it is possible to close the square with very high accuracy just by pressing the “Select Closing Point” button and pressing the **right** SK in correspondence of the first point of the square. The trackball cursor must be placed near to that point, which will close the polygon and the right SK (in correspondence of “Close” of the Help Line) must be pressed, when ready.

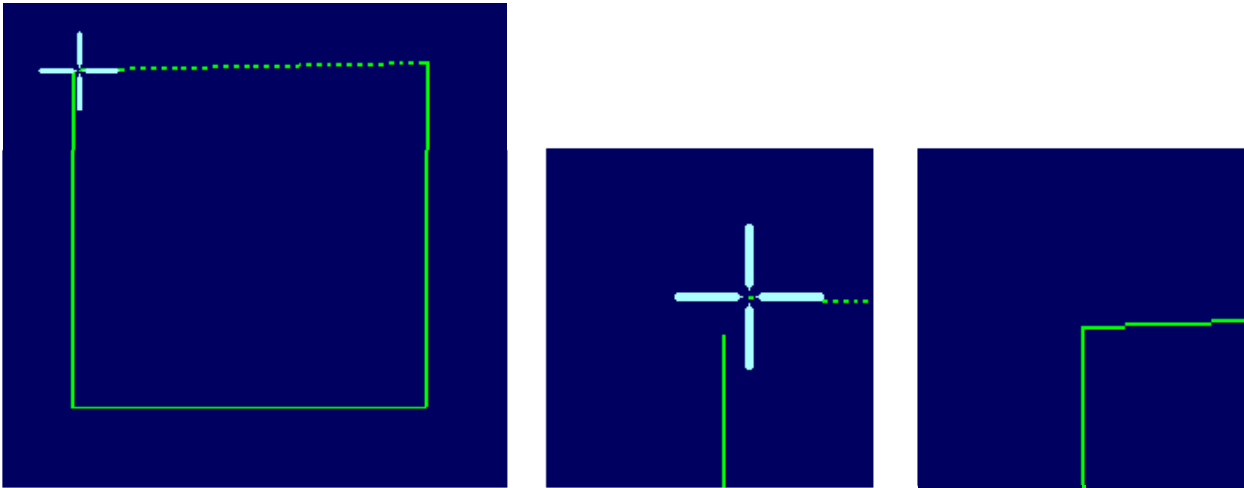


Figure 6.2.2 (Appearance of the polygon during the “Closing Point” mode)
(Detail of the Closing Point before pressing “Close”)

Detail of the Closing Point after “Close” has been pressed, Inserting text:

When pressing the centre SK on the PPI, the alphanumeric keypad will be displayed on top of the “Editing Map Menu”. The text in the map can be maximum 10 characters long. Once the text has been written and the operator has pressed the enter key of the keypad, the text will be displayed where the SK was pressed just before the text was entered. After the first text has been inserted, the “Select Text” button will be enabled.

Inserting Symbol:

Pressing the right SK on the PPI, the previously chosen symbol will be inserted with the previously chosen color. After the first Symbol has been inserted, the “Select Sym” button will be enabled.

How to do modifications:

Once the “Select Line”, “Select Text” and “Select Sym” button are sensitive, the operator has the possibility to select an already drawn object to modify, move or delete it. For more details regarding this possibility, refer to par. 6.4 Objects Changes on the Video Map.

After the first element has been inserted, the “Clear Map”, “Shift / Rotate” and “Relative Map” (map type) buttons will be enabled. Since, even if only one element has been defined, these operations should be possible to perform.

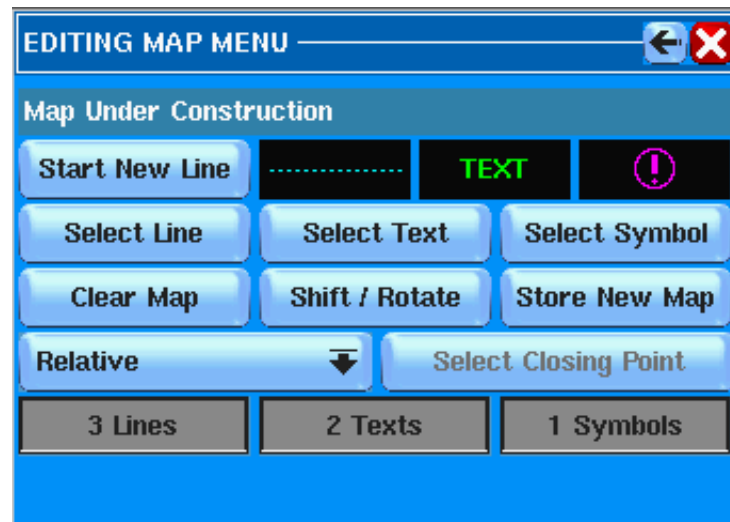


Figure 6.2.3 Editing Map Menu (2)

In the lower part of the Editing Map Menu, three white labels indicate the actual composition of the elements of the opened map, counting the number of Lines, Texts and Symbols. When creating a new map they start from 0 and they change in real time while the objects are inserted into the map.

After pressing the “Clear Map” button, the system will ask for confirmation, and if confirmed, it will remove the map from the PPI. **Note, that if the cleared map was not previously saved, when pressing this button the map will be lost, but if it was previously saved, it will only be removed from PPI, but not from the memory.**

When, for any reason, the operator needs to move or rotate the map, after the first object has been inserted, the “Shift / Rotate” function shall be used. Proceed as follows:

To move the map:

1. Press the “Shift / Rotate” button and move the trackball on the PPI. The Help Line will change to “Posit Adj”, “Undo Adj” and “Angle Adj”. “Adj” stands for Adjustment.
2. Press the left SK and the map will be anchored to the trackball. The Help Line will show “Apply Shift”, “Undo Adj” and “Unused”. Note that it is not necessary to hold the SK pressed down to keep the map anchored to the trackball. It will be anchored after the first click, and released after the second click.
3. Move the trackball and consequently the whole map to a desired location.
4. Press the left SK again and the map will be released. To move it again, press “Shift / Rotate” a second time.

To rotate the map:

1. Press the “Shift / Rotate” button and move the trackball on the PPI. The Help Line will change to “Posit Adj”, “Undo Adj” and “Angle Adj”. “Adj”. Stands for Adjustment. This is the same step as in the “move map” procedure.

2. Press now the **right** SK, and the map will be anchored to the trackball and a line will be drawn from the trackball cursor to the origin of the map. Normally the origin of the map is Own Ship position. It can be moved from that position if the map has been shifted. The Help Line will show “Unused”, “Undo Adj” and “Apply Rot”. Note, that to anchor the map to the trackball, it is not necessary to hold the SK pressed down. It is anchored with the first click, and released with the second click.

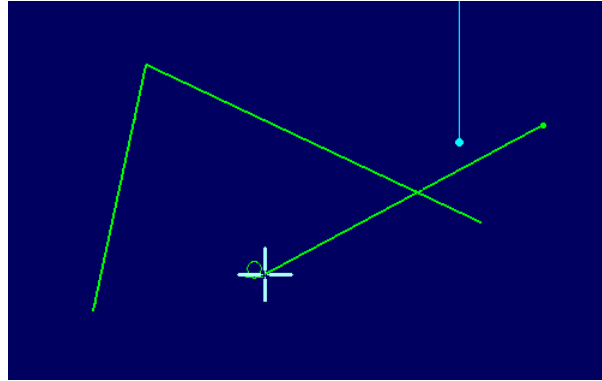
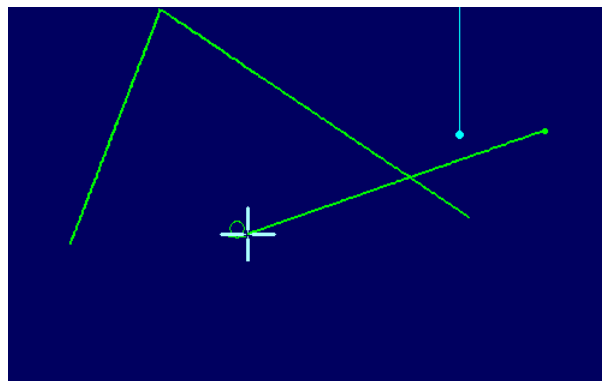


Figure 6.2.4 Help Line in “Apply Rotation” mode and appearance of the map before rotation

3. Move the trackball and consequently rotate the map to the desired orientation.



Appearance of the map during the rotation

4. Pressing the right SK again, the map will be released. To Rotate it again, press “Shift / Rotate” a second time.

During Rotating and Shifting, it is possible to return to the original position just by pressing the centre SK button, corresponding to the “Undo Adj” function of the Help Line.

To change the map type:

To change the map type, press the button located under the “Clear Map” button, which indicates the type of the current map: “Relative Map”, “Dead Reckoning Map” or “Geographic Map”. After it has been pressed down, a short list with the 3 possibilities, as listed above, will be displayed. By selecting one of them with the trackball, the new map type will be applied and the text on the button will be changed consequently.

The system will not accept the Dead Reckoning choice, if the ship speed information is missing, the Geographic Map choice, if the EPFS signal is missing, and neither of them will be accepted, if the Gyro input signal is missing.

When the Geographic Map type is used, another button will appear in the lower part of the Editing Map Menu: "Geo Map Manual Settings". Pressing it, another window will be displayed: The "Geo Map Manual Settings Menu". In this menu the operator has the possibility to manually insert the coordinates of the points and of the objects in the map. It is also possible to correct or refine the position of them. (Refer to par 6.5 for more details)

To save the map:

To save the new map, press the "Store New Map" button and enter the map name using the alphanumeric keypad displayed. If no name or an already existing map name is inserted, after the Enter key is pressed, a warning will be displayed and another map name will be requested.

6.3 OPERATING WITH A SELECTED VIDEO MAP

When pressing the "Maps" button and selecting a map from the list, the operator has the possibility to open it, with the "Open Map" button, or delete it with the "Delete Map" button. When choosing to open it, the desired map will appear on the PPI. The "Editing Map Menu" will also appear in the Displaying Information Section. The appearance of the "Editing Map Menu" is very similar to the Figure 6.2.2, but with the name of the map displayed instead of "Map under construction". The text "Insert" will appear instead of "Start New Line" and "Update Changes" instead of "Store New Map".

The three labels in the lower part will indicate the number of lines, texts and symbols composing the map. If one of them is zero the correspondent button is disabled.

With the "Editing Maps Menu" is visualised, it is possible to modify each part of the map, such as:

- Move lines (moving only the selected extremity of the segment, leaving the other end point in its original place), symbols and texts
- Modify lines and symbols type
- Change colors of lines, symbols and texts
- Modify the texts
- Insert new objects
- Insert lines between two connected lines
- Delete objects.

If no more changes are intended to be done, the "Editing Maps Menu" can be closed and the map will remain on the PPI. To remove the map from the PPI, press the "Maps" button and then press the "Undisplay Map" button. After the confirmation, the map will be removed from the PPI.

6.4 EDITING OBJECTS ON THE VIDEO MAP

It is possible to make modifications to maps “under construction” and stored maps. Modifications can be performed only by accessing the “Editing Maps Menu”.

With the “Editing Maps Menu” active, the object to be modified must be selected. The selection can easily be performed just by pressing the “Select” button related to the type of element intended to be modified. For example, to modify a line, the “Select Line” button must be pressed.

The following example shows how to modify a line of the map:

1. Press “Select Line” (Note that the “Select Line” button is not enabled if the map does not include lines).
2. Moving the Trackball pointer on the PPI, the Help Line will show “Hook Line”, “Modify Line” and “Cancel Line”.
3. Move the Trackball pointer over the line to be modified and a kind of highlighting lines will appear around the line (Figure 6.4.1).

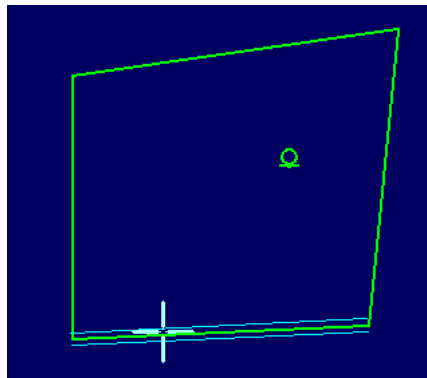


Figure 6.4.1 Appearance of the highlighting (Focusing) of a line of the map

4. To delete the line, just press the right SK (correspondent to “Cancel Line”) when the line is highlighted.
5. To move the line, when it is highlighted, press the left SK (correspondent to “Hook Line”); note that only the extremity of the selected side will be hooked and the other end of the segment will remain in its position. During the movement, the line is drawn with a different style (see figure 6.4.2).

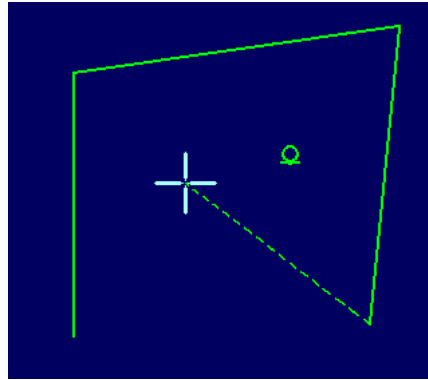


Figure 6.4.2

When the extremity of the line is hooked to the Trackball (during the movement) the Help Line will show “Place Line”, “Unused” and “Close”, giving the possibility to place the point of the segment where desired with the left SK and to close the segment on another point of the map (for example to close a polygon) with the right SK.

In case the operator choose to press the right SK to close the line to another point of the map, the other point must be reasonably near (50 pixels), otherwise the system will show: “WRONG: No Point Near Enough”.

6. To modify the highlighted line, press the centre SK and the following window will appear:



Figure 6.4.1 Line Type Menu

The buttons of the left column allow changing the line style and the ones of the right column allow changing the line color. The “Accept” button must be pressed to apply the modifications, otherwise press “Discard” to return to the previous settings.

The same operation can be performed also for the other types of objects by pressing “Select Text” or “Select Symbol”. The procedure is the same, the string “Line” is replaced by “Text” or “Sym”. In case of text changing, it is also possible to correct a wrong text by pressing the “Change Text” button. The menus used to implement the modifications are shown in Figure 6.4.2.

Please note that it is possible to open the "Line Type", "Text Color" and "Symbol Type" menus also without selecting any object, just by clicking on the corresponding black label. This is now the preset and will be applied for the next object of the actual type that will be inserted. For example, having a map with 4 green standard lines, clicking in the black label related to the lines formatting and changing the color to red and the line style to dashed, the next line that the operator will insert in the map (the 5th) will be red and dashed.

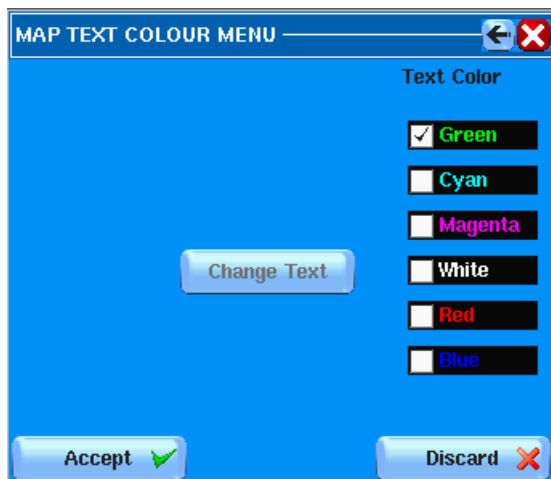


Figure 6.4.2 Text Color Menu

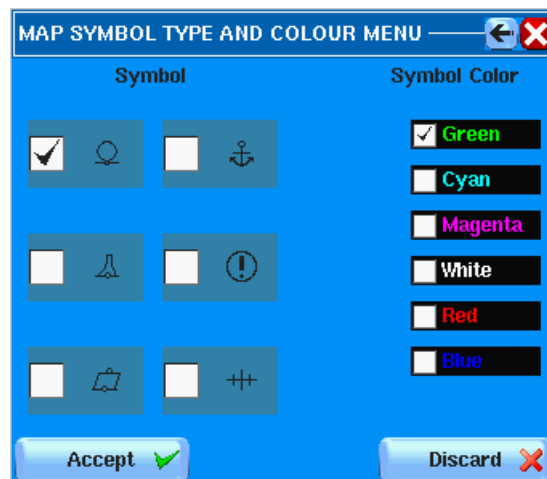


Figure 6.4.3 Symbol Type Menu

Once the modifications are finished, the map must be saved. If the map was under construction without any name yet, the system will just ask to insert a name for the new map. Otherwise, if the map has been loaded from the memory and therefore already has a name, the system will ask to save the old map and updating it with the new modifications or save the current map as a new one, consequently asking for a new map name also.



Figure 6.4.4 Confirmation window in "Update Old or Save as New" condition

6.5 GEOGRAPHIC MAP MANUAL SETTINGS MENU

If a recalled map is of a geographic type or if an "Under Construction" is being built as geographic type, a new button labelled as "Geo Maps Manual Settings" will appear in the lower part of the Editing Maps Menu. When pressing it, the "Geographic Maps Manual Settings Menu" will be displayed, giving the possibility to insert the geographic coordinates directly (helpful in case that the map is drawn also on the chart or in other equipment and the coordinates are easily available. It is also helpful to use or to draw a geographic map while Own Ship is very far from the place shown on the map).

GEOGRAPHIC MAPS MANUAL SETTINGS MENU ←				
Point 3	Lat	43°	44.234'	N
Ins Point ↓	Lon	011°	05.039'	E
Text 0	Lat	43°	44.063'	N
Ins Text	Lon	011°	03.637'	E
Sym 0	Lat	43°	43.669'	N
Ins Sym	Lon	011°	05.762'	E

Figure 6.5 GEOGRAPHIC MAPS MANUAL SETTINGS MENU



Figure 6.5.1 highlighting test symbol

While this menu is visible on the PPI, an object for each type is selected and the highlighting helps to find them on the screen. By default, the first line, the first text and the first symbol are automatically selected (as shown in the picture on the left).

To select other elements and to move them, the operator has two different ways, which can be used independently:

1. Selection, anchoring and dragging with the trackball cursor and the SKs.
2. Selection and changing the geographic coordinates with editing labels and buttons of the Geographic Maps Manual Settings Menu.

6.5.1 Selection and Movement with the trackball cursor

When the Geographic Maps Manual Settings Menu is displayed, placing the Trackball cursor on the PPI, as the Help Line suggests, the left SK takes the function of selection of objects.

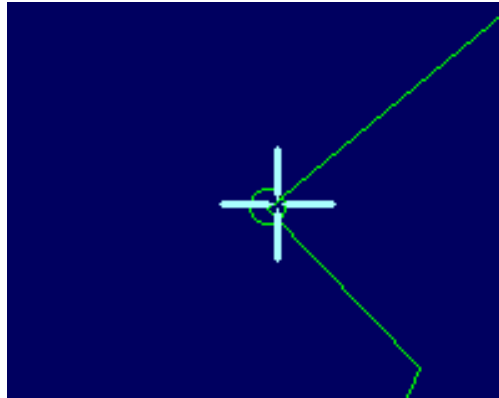


Figure 6.5.1 Trackball cursor

Placing the trackball cursor over an end point of a line, it will be highlighted with a green circle (as shown in the picture).

For the texts and the symbols, highlighting will appear as a rectangular frame around texts and symbols. This highlighting is not displayed if the Trackball point is on an already selected element.

When clicking on the highlighted element with the left SK, the element will be selected and the Help Line will change as shown in the picture on the right.



Figure 6.5.1.1 Visualization highlighting

The picture on the left indicates the appearances of the selected elements. In the Geographic Map Manual Settings Menu an element of each type is always selected. When opening the menu, the objects numbered zero are automatically selected.

When pressing the left SK on the selected element, it will be hooked to the Trackball pointer. Moving the Trackball to a new position, will move the selected element. The Line has changed as in the right picture. Once the Trackball is in the desired position, press the left SK to release the object, and the point selected will be moved there with the lines connected to it converging there also, as shown in the below figures.

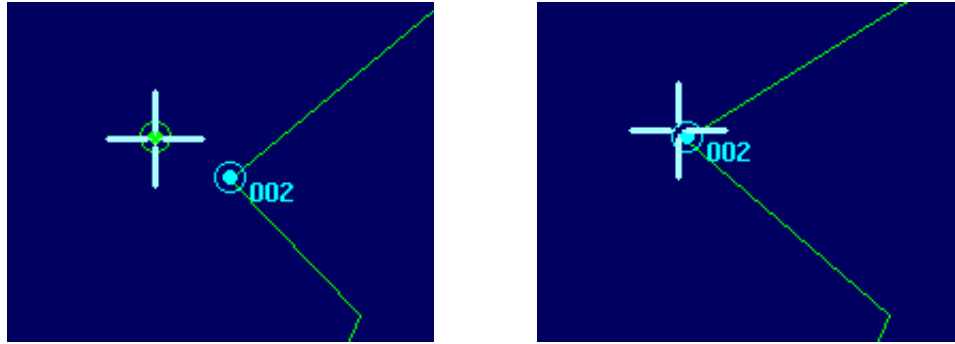


Figure 6.5.1.1.1

(Moving the Trackball with the point hooked)

(Releasing the point)

Clicking on it again, the object will be hooked to the Trackball cursor again (the lines will not move while the pointer moves, but the highlighting symbol will). Once moved where desired, press the left SK again to release it in the new place.

6.5.2 Selection and Movement by means of the editable labels and buttons

The position of selected objects and also the selection of an object can be changed placing the Trackball pointer over the coordinate labels of the figure to be changed. For example, if we wish to change the latitude minutes of the "LIVORNO" text, place the Trackball pointer on the label indicating the latitude minutes of the selected text (44.063'). The Help Line will show "Decrease", Enter Value" and "Increase". Pressing the left and right SKs, the value in the label will be decreased or increased one step (0.001') for each press. Holding them pressed, after a few seconds, the value will change quickly in steps of 0.010'. Otherwise, by pressing the centre SK, the numeric keypad will be displayed giving the possibility to insert figures directly.

Changing the degrees instead of the minutes, or changing the minutes too much, the object could disappear from the maximum range scale of the PPI. The "N" and "E" buttons' functions are to specify the latitude and longitude orientations (North or South, East or West).

All the changed values will be applied to the selected item. In the example above, the "LIVORNO" text was already selected. To select another object the Trackball pointer must be placed on the correspondent label. As in the example it must be placed on "Point 3" to select a point, "Text 0" to select a text and "Sym 0" to select a symbol. The help line will appear the same as when changing the latitude figure, so pressing the right SK the object following the one already selected will now be selected and so on. For example, pressing the right SK, with the Trackball pointer on "Point 3", the point 4 should be selected, but the label could be showing "Point 3 E", "E" stands for end, normally the selection on the screen indicates the start point of a segment. The "Point 3 E" case means that the segment starting from the point 3 ends the multi-line and the selection "Point 3 E" allows anchoring the final point of the multi-line, which is not the point 4, but the ending point of the segment 3.

To insert new texts or new symbols "Ins Text" or "Ins Sym" must be pressed, and the new object will be placed in the centre of the map (normally Own Ship position). Once the new object is placed, follow the above procedure to move it where needed.

To insert new lines the operator must insert new points. To do that the “Ins Point” labelled button must be pressed. A list will be visualised under the button, with the 4 possibilities of insertion modes:

1. Insert New Point After Selected. The point will be inserted after the selected one, re-numbering the points following the selected one. If the selected point was connected to another one, the new point will be connected to it. The new inserted point will be temporary placed in the same position of the end of the selected and the beginning of the following, and then the operator can move it as desired.
2. Insert New Point Before Selected. The point will be temporary inserted in the place of the selected one. It will be in the same position of the selected and of the previous one, and then the operator can move it as desired. The point selected and the following ones will be re-numbered.
3. Insert New Point Starting New Segment. The new point will be placed in the centre of the map, creating two points which are intended to be the start and the end of a new segment. The operator can move them as desired.
4. Append New Point After The Last Point. The new point will be placed in the same position of the last point of the map, creating two points which are intended to be the start and the end of the new segment. The operator can move them as desired.

Point 0	Lat	43°	37.329'	N
Ins Point	Lon	011°	01.004'	E
Insert New Point After Selected Insert New Point Before Selected Insert New Point Starting New Segment Append New Point After The Last Point				

Figure 6.5.2

6.6 IMPORT AND EXPORT A MAP

To transfer a map, open the USB STORAGE MENU by pressing the Map USB Sharing push-button inside the VIDEO MAPS MENU with a USB Memory Stick inserted on a USB port of the DC-CORE unit.

The System Maps list includes all maps stored inside the Argus radar, USB Maps lists all the maps saved on the USB Memory Stick.

Use the trackball pointer to select the map to transfer and press the arrow push-button to select the transfer direction.

The Map USB Sharing push-button is also available from the EDITING MAP MENU, when a map is edited or saved.

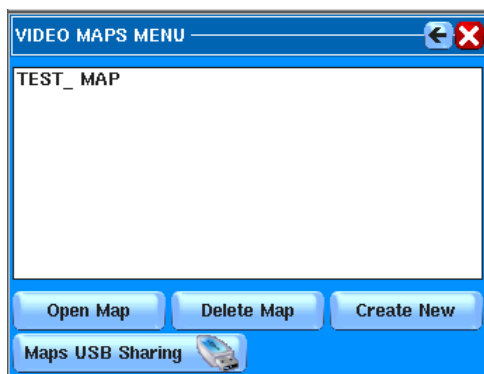


Figure 6.6 VIDEO MAPS MENU

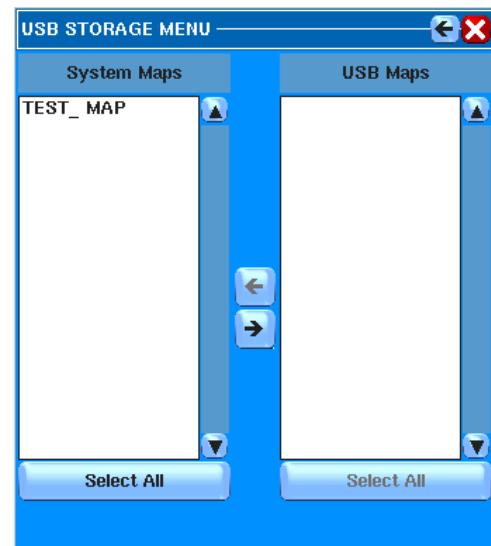


Figure 6.6.1 USB STORAGE MENU

CHAPTER 7

ALARMS AND SYSTEM FAILURES

In the Alarm section (Figure 2.3.2) the System will visualise all information regarding Alarms, Warnings / Wrong Orders and System Failures.

In the first column, the upper button is the System Status, which opens the menu in which it is possible to check the status of the most important parts of the system. In Figure 7.1 it is labelled with icon ! and drawn in red background, to warn about a failure present in the menu. The button below is the Alarm List, which displays the list of the last 100 Alarms, Warnings and System Failures.

In the second column, there are two big buttons, the top red button shows the last alarm present at that moment, and the bottom yellow button displays the warnings and wrong order areas.

When a new alarm is presented and the old one is still valid, the latest one is presented on top of the previous one. An alarm will never be lost. Alarms are simply stacked one on top of the other and will be presented again after the top one is acknowledged.

When a target becomes a dangerous target, its symbol on the screen changes to red color, and start to flash. When the operator presses the acknowledgement button, the dangerous target stops flashing, remaining visualized in red. In this situation, if another target becomes dangerous, it will start to flash, and the acknowledge button will be displayed again.

If all alarms and wrong orders have been acknowledged, the places of the two big buttons are empty (normal working condition with no alarms).

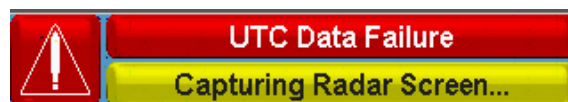


Figure 7.1 Alarms/System Status

7.1 SYSTEM STATUS

The System Status button icon is drawn as a big question mark inscribed in a red triangle (Figure 7.1) when a failure is present, or just as SYS STS in normal conditions. Press the button to display the System Status Window.

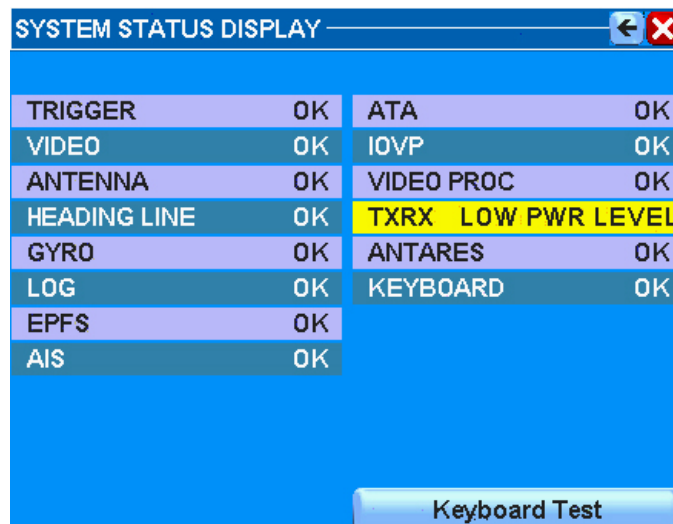


Figure 7.1.1 System Status Window,

When a failure occurs, the label correspondent to the part of the system in failure is highlighted in red background. Otherwise, when a warning occurs, the label is highlighted in yellow background.

The failures are also activating the fail LED of the keyboard and the audio alarm (if it is enabled). The warnings are only visualized in the System Status menu.

Placing the mouse on a warning or failure label, the help line will suggest “More Info” for the left SK. This means that pressing the left SK on a yellow or red drawn label in the System Status menu, another window will be displayed next to the label, with a more detailed description of the problem and a suggestion on how to fix it.

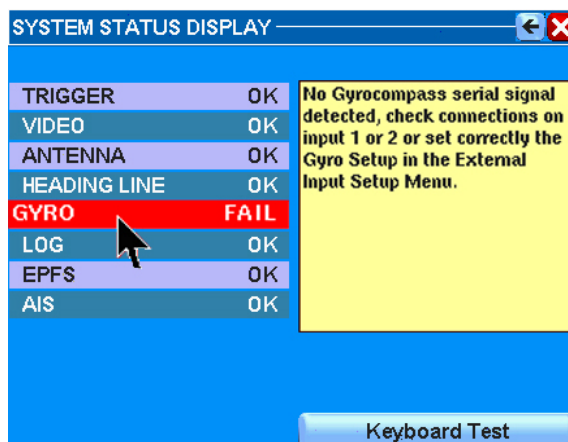
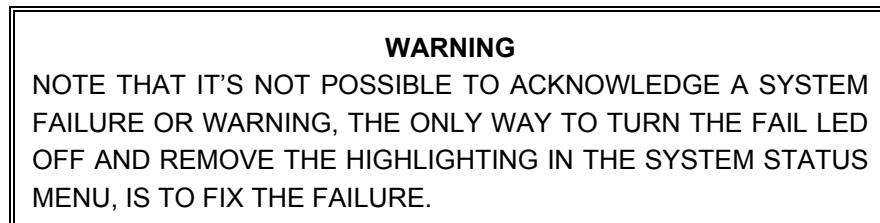


Figure 7.1.2 System Status Window with some failures and with “More Info” activated in the Gyro field.

Placing the mouse over the label of the TXRX failure, besides suggestions in “More Info” for the left SK, the help line will show “All Fails” for the centre SK. So, by pressing the centre SK, a window will appear next to the label with a list of the actual failures of the transceiver. This will help the operator or the service technician to better understand where the possible problem is located. The reason why this feature is available only with TXRX and not with other system failures, is that the transceiver is the only one which can have more than one failure at a time.



7.1.1 Keyboard Test

Using this function, it is possible to test the correct functioning of the keyboard. Each button, the track ball and the EBL and VRM encoders can be tested. Pressing the buttons, an audible beep will confirm it is working correctly. For trackball and encoders, a visible response to the movements will be displayed.

7.2 ALARM LIST

The Alarm List (will be displayed by pressing the Alarm List button) (Figure 7.1).

The alarms in the “ALARM LIST” window begin to flash, showing the time at which the alarm occurred, see figure 7.2.2. Once an alarm situation has been signalled e.g. “UTC data Failure”, it is possible to acknowledge it. In this case, the word (ACK) will appear (figure 7.2.3), which marks a situation that you are indeed aware of and as a result, the system removes the alarm condition as presented in figure 7.1.

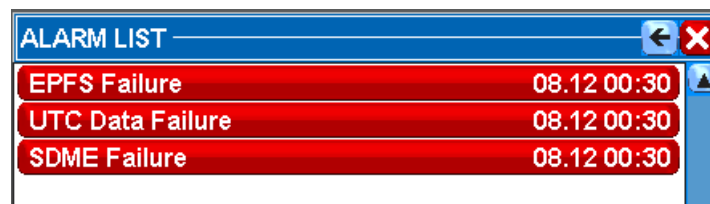


Figure 7.2.2

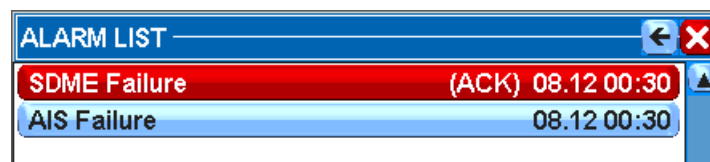


Figure 7.2.3

The alarms that can appear are divided into two categories, Transitory and Status. The first is linked to an instant condition (e.g., the LOST condition of a target that the radar can no longer see). The second remain

inside the alarms list for as long as the Failure condition persists.

When a flashing alarm is present, it is possible to acknowledge simply by pressing the alarm button twice. The first press will open the Alarm window and select the alarm received last, the second press will acknowledge the alarm.

The System can visualise up to 100 items in the Alarm List (Figure 7.2.4). Any alarms over 100 will automatically cancel the oldest to make room for the newest. Next to every item there will be an indication of the time in which they occurred. Those items can be Alarms, Warnings / Wrong Orders or System Failure and they are written in different colors to be quickly located:

- Alarms dark grey on white background
- Warnings and Wrong Orders dark grey on yellow background
- System Failures white on red background.

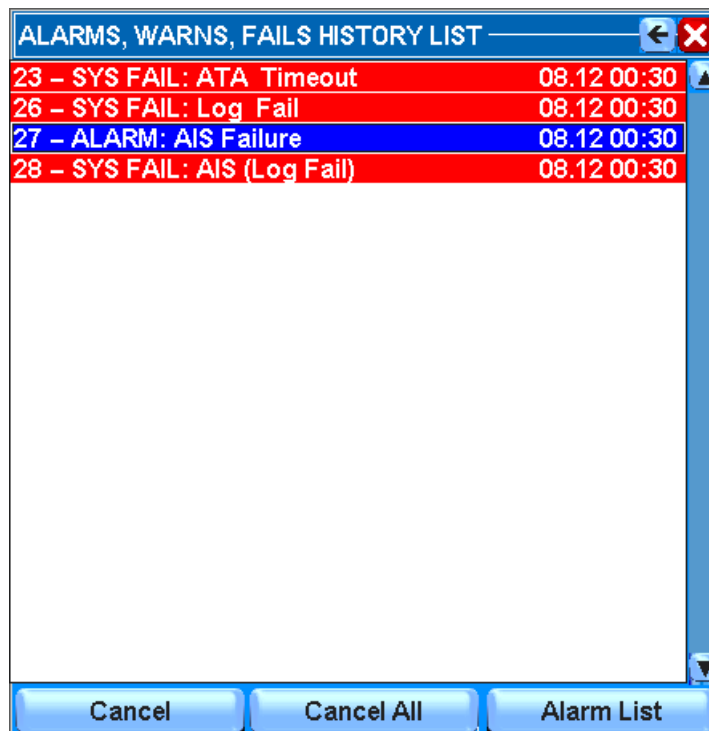


Figure 7.2.4 Alarms, Warnings and Sys Fail History List Window

In the list, it is possible to cancel one, or all the items. Select the item and press Cancel to remove only that entry from the list. It is only possible to acknowledge the alarms by means of the Alarms button (Figure 7.1, second column, red button).

NOTE

It is not possible to clear a system failure or an alarm in the list if its still active. Only the system failures, that are no longer present or the acknowledged alarms, can be cleared.

7.2.1 Audio On/Off



Pressing this button, the operator can switch the audio alarm On and Off. In Off condition, the alarms are only visible, and in On condition, they are visible with a continuous monotone beep.

7.3 RADAR PRESENTATION FAILURE



Inside the Own Ship window, there is a small rotating antenna. This “Heartbeat” symbol shows that the graphic presentation is continuously updated.

If the graphic process displaying the radar picture fails, and the failure is un-recoverable, this small symbol will stop, the system failure light on the control panel will flash and the system fail relay output will be activated.

Table 7.3.1 - System Failure

(1) When the Console is slave

(2) Three phases Synchro/stepper at 0/1

MESSAGE	DISPLAY	MEANING
TRIGGER	NO TRIGGER FAIL	Trigger Pulse absence (W). (1) Trigger Pulse failure.
VIDEO	NO VIDEO FAIL	Video signal absence (W). (1) Video signal failure.
ANTENNA	NO DATA FAIL STOP WRONG PPR	Azimuth signal absence (W). (1) Wrong number of pulse per revolution. Number of pulse per revolution equal to zero The number of pulses per revolution is different from the value inserted manually
HEADING LINE	NO HL FAIL	Heading Line signal absence (W). (1) Heading Line signal failure.
GYRO	NO REFERENCE PHASE ERROR NO PRESET FAIL	No reference signal for gyro input logic (Synchro or external reference type). Phase error. (2) Pre-setting value absence. Timeout when serial NMEA.
SPEED LOG	FAIL	Log failure. Timeout when serial NMEA. If the speed was more than 5 KN and changed suddenly to 0 KN.

MESSAGE	DISPLAY	MEANING
IOVP	FAIL ALPHA EXP FAIL	IOVP program not running Alpha Expansion PCB not communicating
VIDEO PROC	FAIL	Video Processor Unit failure.
KEYBOARD	FAIL NO LINK	Panel Keyboard failure. Panel Keyboard not connected.
ATA	TIMEOUT NOT READY FULL FIFO NO DEV	Automatic Tracking Aid Program in fail Automatic Tracking Aid Program has not started Too much data received from RADAR Extractor Software module for Tracking is missing
TX/RX	NO DATA WRONG VERS. MAGNETRON EOL LOW POWER LEVEL OVERHEATING RX FAIL MODULATOR FAIL SAFETY SWITCH OPEN INTERLOCK OPEN MGN HEATER FAIL -15V FAIL FE FAIL VCO FAIL 15 ISO FAIL MAIN V FAIL NOT RECEIVING	Transceiver serial RX failure. Wrong program version on transceiver. Magnetron End of Life (W). RX failure (W). Temperature exceeded 75° (W). RX Parameters out of nominal values. TX Part failure. The transceiver cannot transmit because the safety switch or the interlock switch on the TX/RX cover is open. Transceiver's case is open for service operation Transmission is not possible when the magnetron's cathode is not heated. -15V PS failure Receiver Front End Failure No Receiver VCO control voltage 15 ISO Failure Main Voltage Failure (< 18 V in 24 VDC ;< 40 V in 48 VDC) No command received from Argus console, tx serial in failure or Receive part of the TX/RX is not working.

NOTE

The meaning of the letter "W" is Warning, and the warning message is yellow.

The following Table lists the possible Alarm Messages. When one of them occurs, the failure LED of the keyboard turns on (Figure 2.2.1, pos. 4), the alarms button is displayed in its area, labelled with the received alarm (Figure 7.1, 2nd column, red button) and if the audio alarm is activated, a sound will start as well. It is possible to acknowledge the alarm by pressing the alarm button, which will remove the alarm from the system until it returns, and the alarm button is labelled with a new alarm when present, otherwise it stays hidden.

Table 7.3.2 - Alarm Messages

MESSAGE	MEANING
Tracked Target Lost	Radar echo not present for more than 10 antenna scans.
Danger Tracked Target	Target has TCPA and CPA less than minimum safe settings.
Tracked Target Auto acquired	Target acquired inside the auto acquisition zones.
Lost Reference Target	Echo Reference target, used to calculate auto drift speed, was lost (see Radar Target Lost Target).
Anchor Watch Alarm	An automatic tracked target defined as anchor watch fixed point, moves more than maximum preset.
Position Invalid	Position data coming from a connected sensor, contains an invalid position, after a period of valid positions.
Position Available	A position has been received from a connected sensor, after a period of inactivity.
Position Unavailable	No position data are coming from a connected sensor, after a period of activity.
Target in Guard Zone	A target entered into a Guard Zone.
AIS Danger Target	An AIS target has TCPA and CPA less than minimum safe settings.
AIS Lost Target	Position update timeout.
AIS Target Auto acquired	AIS changed from sleeping to active state in the auto acquisition zones on the screen.
Training Tgt CPA Out of Range	During the simulation of the Training Target, the CPA calculated is incorrect.
Training Tgt TCPA Out of Range	During the simulation of the Training Target, the TCPA calculated is incorrect.
Max active AIS capacity	A new AIS activation is requested and the capacity limit has been reached. The command is executed, but the farthest AIS target will change to sleep status.
AIS Capacity exceeded	When 95% AIS capacity limit is reached, every new AIS activation displays this warning.
Speed Over Ground Fail	The speed over ground measured with the SDME sensor is invalid or not available.
Speed Through Water Fail	The speed through water measured with the SDME sensor is invalid or not available.
Gyrocompass Failure	Operation not allowed.

MESSAGE	MEANING
SDME Failure	Speed sensor is in failure.
EPFS Failure	Speed from position sensor is not available.
AIS Failure	AIS transponder is not communicating.
UTC Data Failure	No UTC time is available.
Geodetic Datum Failure	No Geographic Datum available.

The following table lists the possible messages displayed when a wrong operation is carried out. This wrong operation does not influence the System. When a Wrong Operation message is generated, the wrong orders button is displayed in its area, labelled with a message correspondent to the wrong action performed (Figure 7.1, 2nd column, yellow button).

The Wrong Orders can be acknowledged by means of the wrong orders button.

Table 7.3.3 - Wrong Operation Messages

MESSAGE	MEANING
WRONG: No Object	Not documented.
WRONG: No Target	No target under the cursor during selecting or deleting operations.
WRONG: Too many	Too many tasks activated for that window.
WRONG: Too Far	Cannot acquire a Radar echo at a range higher than 26 NM.
WRONG: Min Value is Start +12	Sector blanking cannot be more than 12°.
WRONG: Max Value is End -12	Sector blanking cannot be more than 12°.
WRONG: Min Value is End -12	Sector blanking cannot be more than 12°.
WRONG: Max Target Capacity about to be Exceeded	95% of the target capacity has been reached.
WRONG: Task Already in USE	Not documented.
WRONG: No file by That Name Found	Not documented.
WRONG: TT UnKnown Cmd	Not documented.
WRONG: Too Close	Cannot acquire a Radar echo at a range less than 30 m.
WRONG: Too Many Tracked Tgt	Not documented.
WRONG: TT Unknown Cmd	Not documented.
WRONG: TT No Target	Not documented.

The following table shows the various warning messages that are displayed.

Table 7.3.4 - Warnings Operation Messages

MESSAGE	MEANING
Max Target capacity Exceeded	Maximum Target capacity has been reached. Manual or automatic acquiring are not possible.
SOG/STW speed Changed	Speed changed from speed over ground to speed through water.
Capturing Radar Screen	Speed changed from speed over ground to speed through water.
Position Valid	Position has been received again from EFPS after a period with an invalid value.
DGPS On	The data coming from DGPS contains a DGPS FIX, after a period of no DGPS fixing.
Position Available	Position has been received again from EFPS after a period with position unavailable.
Manual Tuning Required	The RADAR transceiver is not able to make auto tuning.
Talker ID changed	It indicates that the data generation system for geographic position is changed.
INS Timeout	Not documented.
Training Tgt CPA Out of Range	During the simulation of the Training Target the CPA calculated is incorrect.
Training Tgt TCPA Out of Range	During the simulation of the Training Target the TCPA calculated is incorrect.
Trial Executed	Trial Results are displayed on the screen.
Trial Danger Target	The trial manoeuvre simulation, has as result of one or more dangerous targets.
Trial not Possible	Own Ship Rate of turn set, is 0 degrees/min.
Trial Relative Vector	Not documented.
Setup File does not exist	The system setup file does not exist. A default configuration is used.
Setup File too big	Not documented.
Cannot Write Setup File	The Setup file cannot be saved. Contact your nearest Simrad agent.
Wrong setup Version, too old	Not documented.
Setup Version too old, unreadable	A too old setup file version cannot be read. Contact your nearest Simrad agent.

ARGUS RADAR

Alarm and system failures

MESSAGE	MEANING
Updated Setup File version	An old setup file format was read and updated with the current one.
Unsupported Setup File version	Not documented.
Unreadable Map File Version	Not documented.
Unsupported Map File Version	The Map file version is not readable. Contact your nearest Simrad agent.
Backup Software Running	The update of the new software did not work and something is corrupted. The Backup Software has been re-loaded.
Screen Capture Failure	Not documented.
Error reading 1 or More Config File	Not documented.
Trigger Failure	The TXRX's trigger synchronism is in failure.
Video radar Failure	The TXRX's analog video is in failure.
Antenna Radar Failure	The antenna position signal is in failure.
Heading Marker Failure	The antenna heading synchronism is in failure.
DGPS Off	DGPS data contains a no DGPS FIX, after a period of DGPS fixing.
Max Target Capacity Exceeded	Cannot acquire a Radar echo at a range less than 30 m.

In the following Table the possible failures are visualized along with the different categories and the operations allowed or not allowed.

Table 7.3.5 - OPERATING MODES FALLBACK

CATEGORY	FALLBACK	
	POSSIBLE	IMPOSSIBLE
Gyro FAIL	Only RM HUP presentation	- AIS - Acquiring/Tracking Radar Targets - Presenting Geographical/Dead Reckoning Maps
LOG FAIL Note: The EFPS can operate as source of log speed	Only RM	- True vector - Dead Reckoning Map
IOVP FAIL	See Gyro Fail	
EPFS FAIL DTM WARNING OFFSET FAIL WRONG DATUM NO DATUM INVALID POSITION	- Video Display - Radar Target - Radar presentation	- Geographic Map - Latitude and Longitude Data provided by the cursor or in Target Data Display - AIS
VIDEO FAIL AZ FAIL TRIGGER FAIL VIDEO PROC FAIL	- All the presentation (RM/TM etc) - AIS - Maps	- Video Radar - Acquiring/Tracking Radar Targets
HL FAIL	- All the presentation (RM/TM etc) - AIS - Maps	- Acquiring/Tracking Radar Targets
TXRX FAIL Note : Only for - RX FAIL - MODULATOR FAIL - SAFETY SW OPEN - MGN HEATER FAIL - +24 V FAIL	- All the presentation (RM/TM etc) - AIS - Maps	- Video Radar - Acquiring/Tracking Radar Targets
ATA FAIL	- All except Anti-collision functions (included AIS)	- Acquiring/Tracking Radar Targets
AIS	- AIS timeout - VTG timeout	- AIS presentation and AIS anti-collision checks

CHAPTER 8

TROUBLESHOOTING AND MAINTENANCE

8.1 INTRODUCTION

The Argus Radar System requires very little maintenance. What is required by the operator is to inspect the equipment carefully and notice every possible anomaly, such as the integrity of the equipment, the presence of rust, missing paint, and loose screws. It is required by the operator to clean the equipment and remove dust, ash and grease, if necessary, by using a soft cotton cloth and alcohol. Caution must be taken not to use solvent to clean plastic parts.

With regard to the preventive maintenance of the Monitor, refer to the Monitor's User Manual.

8.2 TROUBLESHOOTING

8.2.1 General

This chapter includes the procedures to be followed to determine a faulty component in case a malfunction is detected in the Argus Radar System.

8.2.2 Personnel

A skilled technician with good knowledge of the equipment must be involved in the troubleshooting procedures.

8.2.3 Tools and Instruments

In addition to general tools (screwdrivers, pliers, etc.), the instruments of Table 8.2.1 are required.

Table 8.2.1 - List of Recommended Instruments

Pos.	Description	Type	Note
1	Digital multimeter	2 Channels, 100 MHz	Insulated handle
2	Set of screwdrivers and socket wrenches		
3	Oscilloscope		

8.3 TROUBLESHOOTING PROCEDURES

8.3.1 Safety Precautions

WARNING

Disconnect the Main Power Supply cable from the electrical switchboard connector before handling any parts Inside the Core unit.

8.3.2 Troubleshooting Operations

Table 8.3.1 lists possible failures that may occur, when using the equipment. If the Checkpoint result is negative, Remedy indicates the action to correct the fault.

Table 8.3.2 provides a list of the LED mounted in the system or on the boards, by means of which it is possible to analyse the functioning of the boards themselves.

Table 8.3.1 - List of Main Possible Failures

PR	FAULT	CHECKPOINT	REMEDY
1	Turning on the control panel, there are no lights in the indicators	1 Check fuses F2 and F3 on Alpha Board 2 Check correct Line Voltage (from 85 to 250 V) 3 Check Red LED D32 on Alpha Board 4 Check +5 V on TB pin 7 over KEYNT_2K Board	1 Replace the blown fuses 2 Correct line wiring / input voltage 3 Replace Alpha Board 4 Replace KEYNT_2K Board
2	Turning on the Monitor, there is no light in the LED		Check the monitor's technical manual
3	Turning on the System, the Failure LED is flashing alternately	1 Check LED D1 and D2 green flashing on Antares Board 2 Check LED D1-D2 flashing with one of the codes defined on table 2.2.2	1 Replace Antares Board 2 Replace Antares Board 3 Correct control panel wiring
4	ATA failure message in System Failure window		Replace Antares Board

PR	FAULT	CHECKPOINT	REMEDY
5	KEYBOARD failure message in System Failure window	1 Check NO LINK message	1 Correct keyboard cable wiring 2 Replace KEYNT_2K Board 3 Replace Antares Board
6	GYRO / LOG failure message in System Failure window	Check if the gyro/log wires are correctly connected Check if the gyro/log is faulty	1 Correct wiring 2 Check the proper setting 3 Check the gyro / log technical manual
Video Combined Connections			
7	TXRX1, 2, 3 or 4, No Data PRF Fault	1 Check TXRX x ON	1 Check if the transceiver is turned on 2 Check the proper setting
		2 Check the Video Amplitudes in the Video Level Adjustments menu	3 Adjust at 240
		3 With the multimeter check Video connections	4 Check if the Video's wires are correctly connected and if they are good
		4 Check the combined data at TP35 (TXRX1) or TP27 (TXRX2) of Antares Board	5 If not present, change Alpha Board (or Alpha Expansion Board if present) 6 If it is present, Change Antares Board

Standard Connections			
8	No Radar video displayed without an Antenna or trigger Failure	1 Check VIDEO PROC FAIL message in System Failure window 2 Check VIDEO FAIL message in System Failure window	1 Replace Antares Board 2 Check video noise presence over the coaxial cable of the selected transceiver 3 Check the transceiver technical manual 4 Check the Video Amplitudes on Video Level Adjustments menu and set it to 240 5 Check the video signal at TP35 and TP27 of Antares Board 6 If it is present, change Antares Board, if it is not present, change Alpha Expansion Board
9	TRIGGER FAIL message in System Failure window	1 Check trigger presence on the coaxial cable of the selected transceiver 2 Check Trigger signal on TP9 (TR1) or TP4 (TR2) of Antares Board	1 Correct coaxial cable wiring 2 Check the transceiver technical manual 3 Check if the selected polarity is correct 4 If not present, change Alpha Expansion Board 5 If present, change Antares Board

Table 8.3.1 - List of Main Possible Failures (Continues)

PR	FAULT	CHECKPOINT	REMEDY
10	ANTENNA FAIL message in System Failure window	1 Check Azimuth signal presence over the selected transceiver's wire 2 Check Azimuth signal on TP7 (ACP1) or TP5 (ACP2) of Antares Board	1 Correct cable wiring 2 Check the transceiver technical manual 3 If not present, change Alpha Expansion Board 4 If present, change Antares Board
11	HEADING LINEA FAIL message in System Failure window	1 Check Heading Line signal presence over the selected transceiver's wire 2 Check Heading Line signal on TP10 (ARP1) or TP2 (ARP2) of Antares Board	1 Correct cable wiring 2 Check if the correct polarity is selected 3 Check the transceiver technical manual 4 If not present, change Alpha Expansion Board 5 If present, change Antares Board
12	TX/RX failure message in System Failure window	1 Check TX/RX NO DATA message in System Failure window 2 Any other failure	1 Check if the transceiver is switched on, if the PWON signal is present and if the serial cable is correctly connected 2 Check the proper setting 3 Check the transceiver technical manual
13	Warning CCTV not responding	Verify that the communication between the wide screen monitor and the Core unit is working.	Fix the communication, checking that cabling is correct (see installation drawings)
14	Black screen in CCTV video	Verify that CCTV is operative and connected to the monitor	Fix the communication, checking that cabling is correct (see installation drawings)

Table 8.3.2 - LED Indication

Board	Ref.	Fig.	Pos.	Color	Signal	Status	Indication	Notes
				Red	PWON	Lit	Main line ON	Energised units
				Green	SFT	Lit	Safety switch	Antenna can rotate
ALPHA	D32			Red	+5V	Lit	+5V OK	Signal available
	D33			Red	S1	Lit # ♦	S1 OK	Signal available
	D34			Red	S2	Lit # ♦	S2 OK	Signal available
	D35			Red	S3	Lit # ♦	S3 OK	Signal available
	D36			Red	REF	Lit # ¥	REF OK	Signal available
ALPHA Expansion	DL1			Green		Flashing	Board controlled by Antares	Running correctly
						Lit	Board uncontrolled	Not running

(Continued)

= Underlighted, when connected to synchro type

¥ = Off, if the reference is internal

♦ = Gray code, one of these should be different from the other two

Table 8.3.3 - LED Indication

Board	Ref.	Fig.	Pos.	Color	Signal	Status	Indication	Notes
ANTARES	LAN Connectors			Green		Lit		LAN connection good
				Yellow		Lit		Activity on LAN
	D1 and D2			Multicolor		Blue	Colilo Boot	Running user interface
						Yellow		Decompress kernel image
						Green		Start image
						Red		Start up Failure
	D1			Yellow		Flashing	CPU A	Graph FPGA not programmed
				White		Flashing		Can't open Graph FPGA driver
				Magenta		Fixed		Successfully opened Graph FPGA driver
				Magenta		Flashing		Link with TRK not working
				Cyan		Flashing		Link with microprocessor "B" not working
				Red		Flashing		Graphic Failure
				Green		Flashing		Working properly
	D2			Yellow		Flashing	CPU B	AVP FPGA not programmed
				White		Flashing		Can't open AVP FPGA driver
				Magenta		Fixed		Successfully opened AVP FPGA driver
				Magenta		Flashing		Link with MMI not working
				Cyan		Flashing		Link with microprocessor "A" not working
				Green		Flashing		Working properly

8.4 CORRECTIVE MAINTENANCE

8.4.1 Introduction

This chapter describes the procedure that must be followed in order to replace a faulty component of the ARGUS CORE UNIT.

8.4.2 Safety Precautions

During the corrective maintenance operations, the following safety rules must be observed if not otherwise specified in the procedures:

- each maintenance operation must be carried out only after the equipment is switched off.

WARNING

SET THE MAIN BREAKER OF THE EQUIPMENT TO OFF AND HANG A PLACARD TO IT, READING "WORK IN PROGRESS DO NOT SWITCH ON".
--

- before removing any component, be sure the spare part is available
- verify the integrity of the spare part and, if possible, perform a functional test

8.4.3 Personnel

Skilled personnel with a good knowledge of the equipment must carry out the replacement operation.

8.4.4 Required Tools and Instruments

To carry out the replacement operation described in this chapter, only normal workshop tools (as screwdrivers, wrenches etc.) are required:

- set of cross and slotted screwdrivers
- set of socket and torx wrenches
- scissors
- tweezers.

8.5 CORRECTIVE MAINTENANCE PROCEDURES

This paragraph provides a detailed description of the operation to be carried out in order to replace a damaged component. Table 8.5.1 List of the Corrective Maintenance Procedures.

Table 8.5.1 - List of the Corrective Maintenance Procedures

Para	Component to be replaced
8.6	Corrective Maintenance Procedures on the Core unit
8.6.1	CORE UNIT Cover Removing and Installation
8.6.2	ALPHA Expansion Board Replacement
8.6.3	ANTARES Assy Replacement
8.6.4	ALPHA Board Replacement
8.6.5	Line Filter Replacement
8.6.6	P.S. Assy Replacement
ERROR! REFEREN CE SOURCE NOT FOUND.	Error! Reference source not found.
8.7	Corrective Maintenance Procedures on the Monitor Unit
8.8	Corrective Maintenance Procedures on the Keyboard Unit
8.8.1	Keyboard Unit Cover Removing and Installation
8.8.2	Keyboard Replacement
8.8.3	Trackball Replacement
8.8.4	Keyboard Panel Replacement

8.6 CORRECTIVE MAINTENANCE PROCEDURES ON THE CORE UNIT

8.6.1 CORE UNIT Cover Removing and Installation

- a) Required Tools
 - . Torx wrench T20
- b) Removing (Figure 8.6.1)
 1. By means of the proper Torx wrench, loosen the screws (pos.1) fixing the cover (pos. 2)
 2. Remove the cover.
- c) Installation
 3. In order to install the cover, perform the removing operation in reverse order.

8.6.2 ALPHA Expansion Board Replacement (optional)

- a) Required Tools
 - . Set screwdrivers
 - . Socket wrench 5,5 mm
- b) Removing (Figure 8.6.2)

1. By following the procedure of Para 8.6.1, remove the CORE UNIT cover.
 2. Remove the BNC and SMB connectors and all the terminals connected to the board. Take note of their position.
 3. Remove the flat cable. Take note of its position.
 4. Use the 5,5 mm socket wrench to loosen and remove the nuts (pos.1) fixing the board (pos.2).
 5. Remove the board.
- c) Installation
6. In order to install the new board, perform the removing operations in reverse order.

8.6.3 ANTARES Assy Replacement

- a) Required Tools
- . Socket wrench 7 mm
 - . Torx wrench T20
- b) Removing (Figure 8.6.3)
1. By following the procedure of Para 8.6.1, remove the CORE UNIT cover.
 2. Remove the SMB connectors, the flat cable and all terminals board connectors connected to the board. Take note of their position.
 3. Use the 7 mm socket wrench and the T20 Torx wrench to loosen the nuts (pos. 1) and screws (pos. 2) fixing the board (pos. 3).
 4. Remove the assy.
- c) Installation
5. In order to install the new assy, perform the removing operation in reverse order.

8.6.4 ALPHA Board Replacement

- a) Required Tools
- . Socket wrench 5,5 mm
- b) Removing (Figure 8.6.4)
1. By following the procedure of Para 8.6.1, remove the CORE UNIT cover.
 2. By following the procedure of Para 8.6.2, remove the ALPHA Expansion Board (optional) and remove the hexagonal spacers, if mounted.
 3. Remove the terminal board connectors, the BNC and SMB connectors and the flat cable from the board. Take note of their position.
 4. Use the 5,5 mm socket wrench to loosen and remove the nuts (pos. 1) fixing the board (pos.2).
 5. Remove the board.
- c) Installation
6. In order to install the new board, perform the removing operation in reverse order.

8.6.5 Line Filter Replacement

- a) Required Tools

- . Socket wrenches 7 mm.
- b) Removing (Figure 8.6.5)
 - 1. By following the procedure of Para 8.6.1, remove the CORE UNIT cover.
 - 2. By following the procedure of Para 8.6.3, remove the Antares assy
 - 3. Remove the faston terminals of the filter. Take note of their position.
 - 4. Use the 7 mm socket wrench to loosen and remove the nuts (pos. 1) fixing the Line Filter (pos.2).
 - 5. Remove the Line Filter.
- c) Installation
 - 6. In order to install the new Line Filter, perform the removing operation in reverse order.

8.6.6 P.S. Assy Replacement

- a) Required Tools
 - . Socket wrenches 7 mm.
 - . Set of screwdrivers.
- b) Removing (Figure 8.6.5)
 - 1. By following the procedure of Para 8.6.1, remove the CORE UNIT cover.
 - 2. By following the procedure of Para 8.6.3, remove the Antares assy.
 - 3. Use the 7 mm socket wrench to loosen the nuts (pos. 3) fixing the P.S. Assy (pos. 4), remove the terminal board plastic cover protection and by means of the proper screwdriver, remove all the wires. Take note of their position.
 - 4. Remove P.S. Assy
- c) Installation
 - 5. In order to install the new P.S. Assy, perform the removing operation in reverse order.

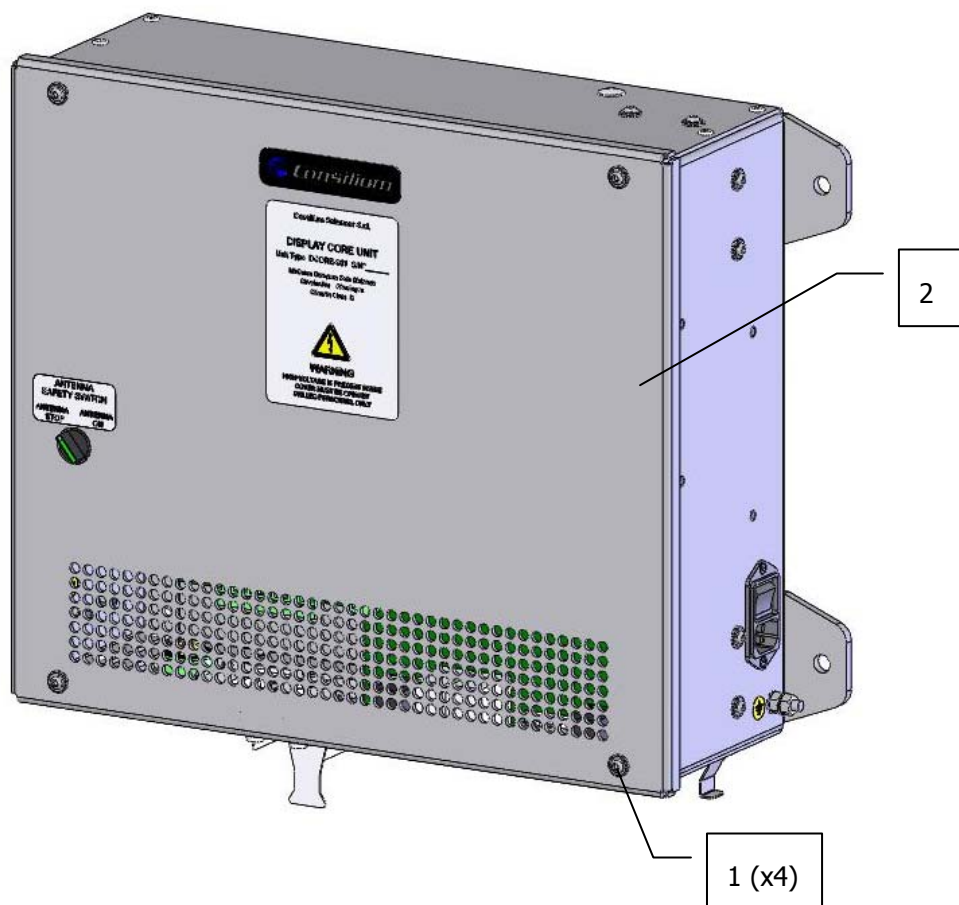


Figure 8.6.1 CORE UNIT

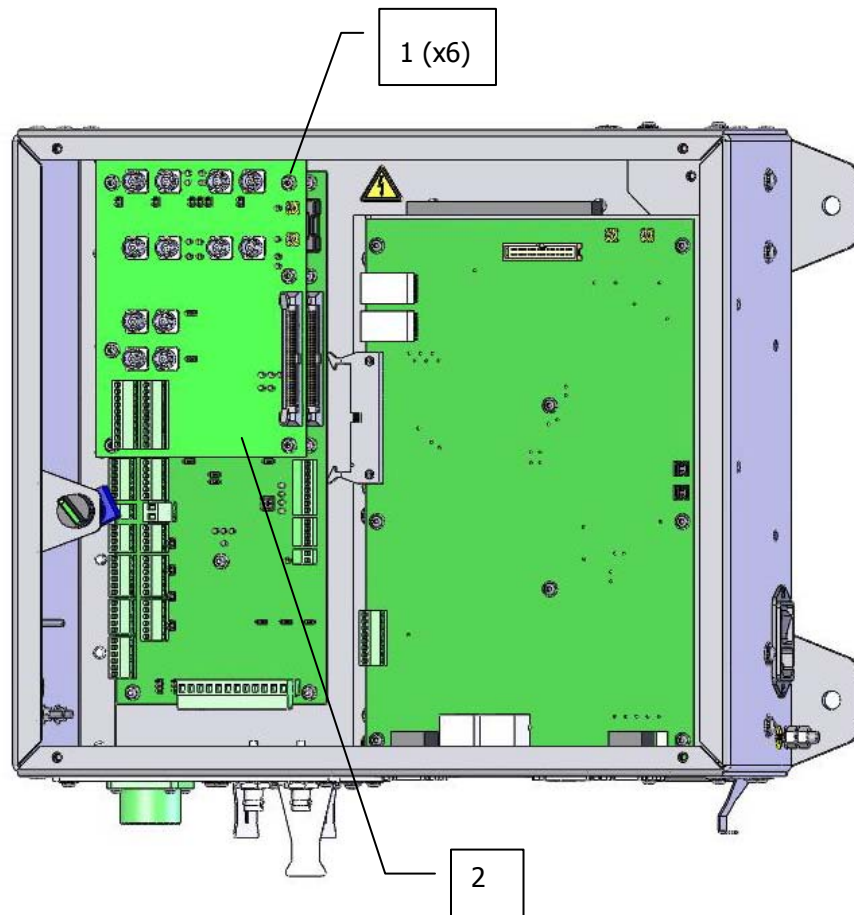


Figure 8.6.2 CORE UNIT

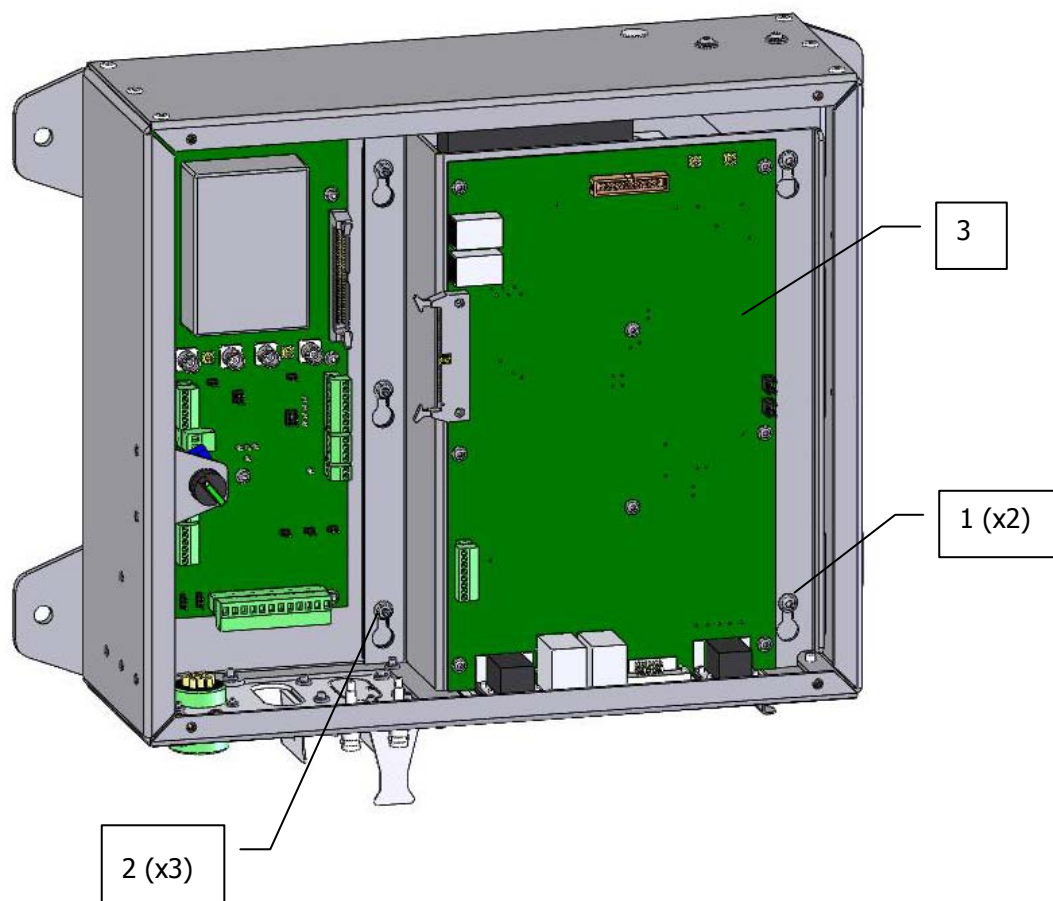


Figure 8.6.3 CORE UNIT

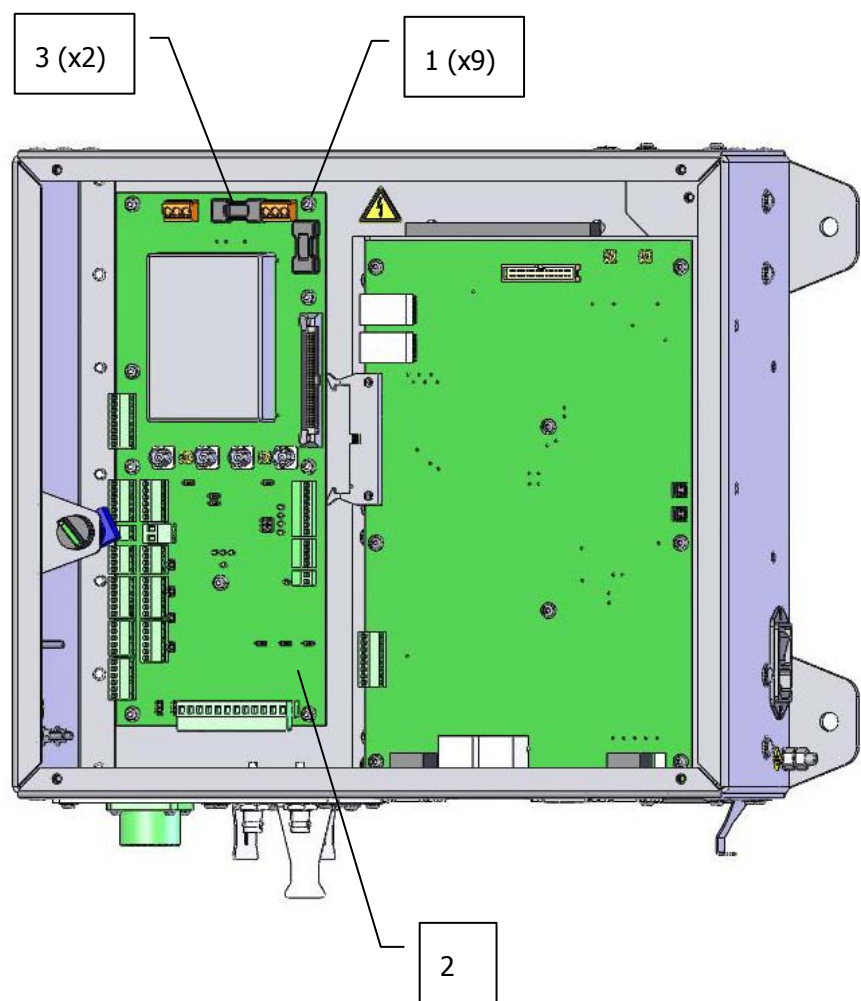


Figure 8.6.4 CORE UNIT

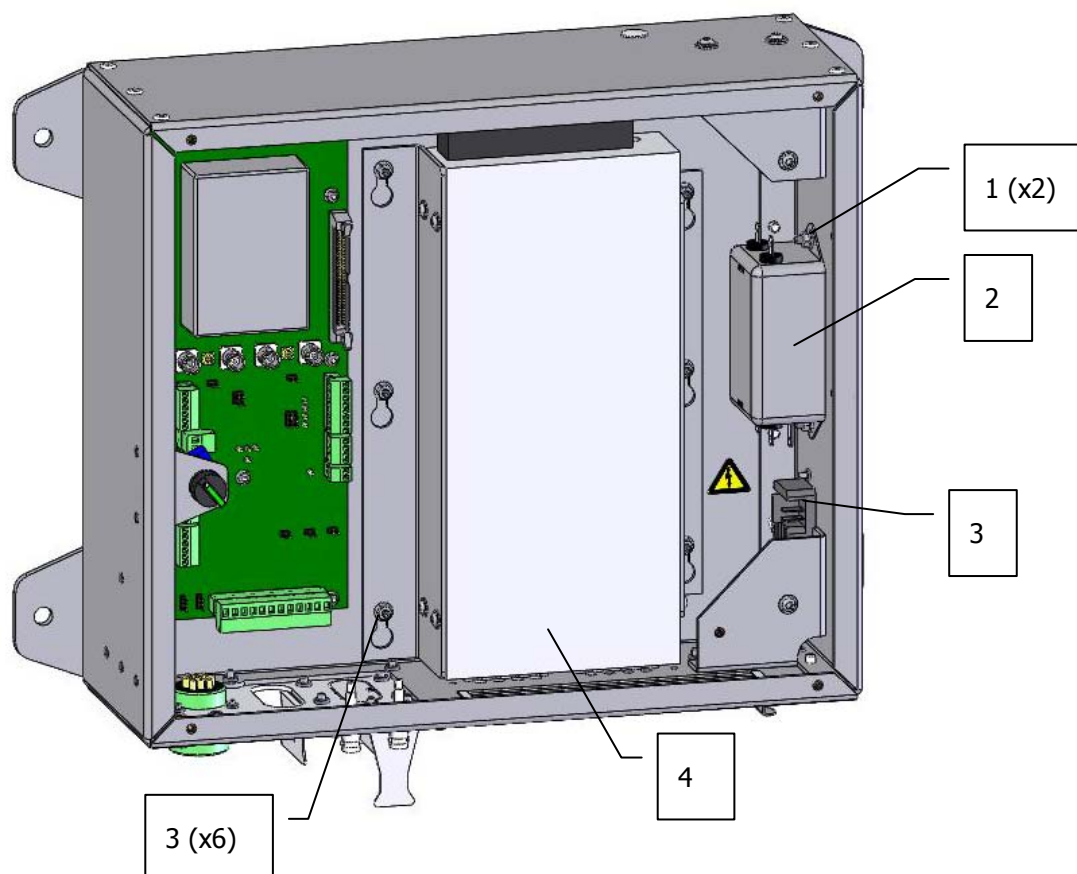


Figure 8.6.5 CORE UNIT

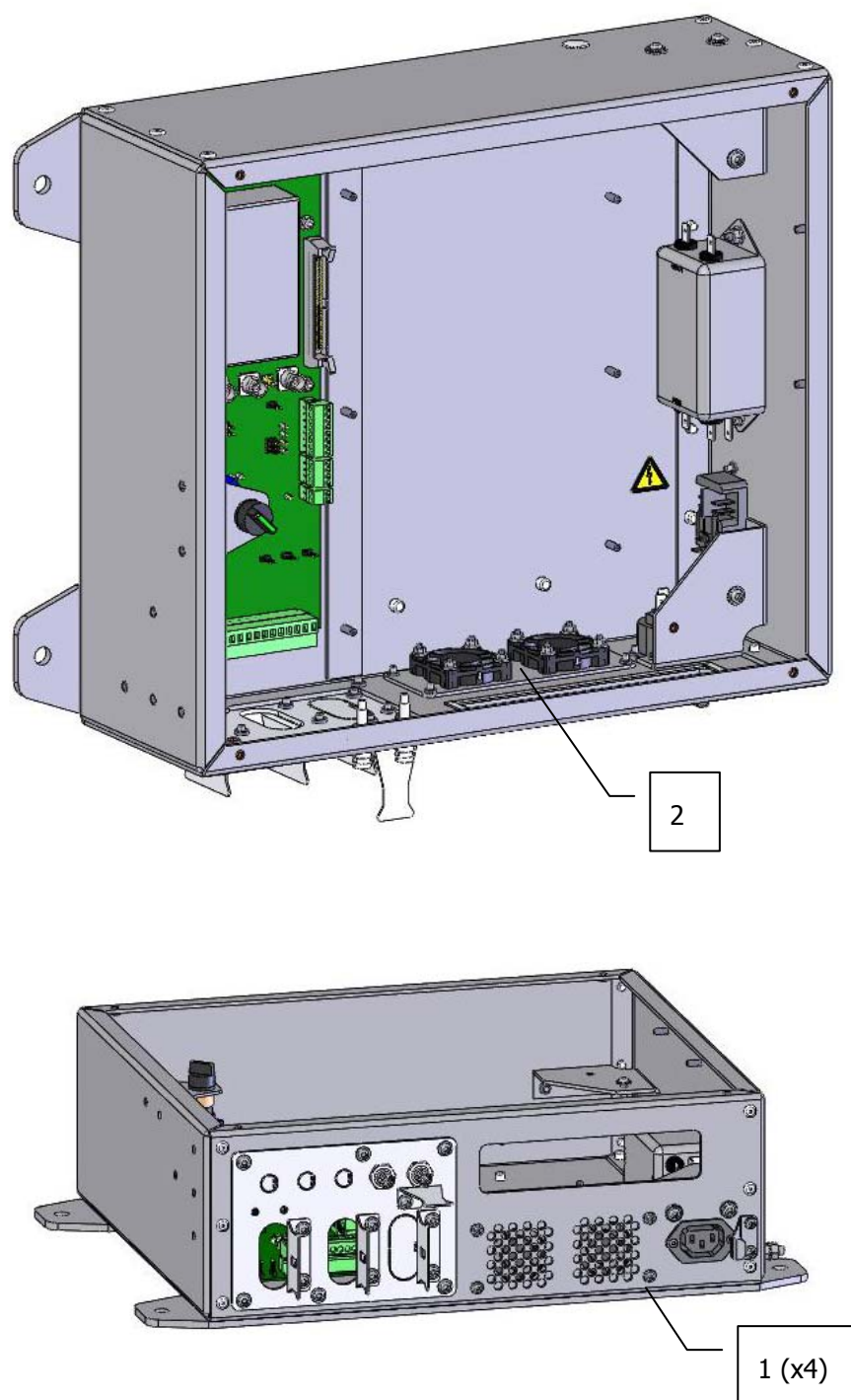


Figure 8.6.6 CORE UNIT

8.7 CORRECTIVE MAINTENANCE PROCEDURES ON THE MONITOR UNIT

In case of Monitor failure, refer to the Monitor's Technical Manual.

8.8 CORRECTIVE MAINTENANCE PROCEDURES ON THE KEYBOARD UNIT

8.8.1 Keyboard Unit Cover Removing and Installation

a) Required Tools

- . Set of socket wrenches.

b) Removing (fig.8.8.4)

1. Use a socket wrench to loosen and remove the nuts (pos. 4) fixing the cover (pos. 5).
2. Remove the cover.

c) Installation

3. In order to install the cover, perform the removing operation in reverse order.

8.8.2 Keyboard Replacement

a) Required Tools

- . Set of socket wrenches.

b) Removing (fig. 8.8.4)

1. By following the procedure of Para 8.8.1, remove the Keyboard Unit cover.
2. Remove the connectors (pos. 6) of the board (pos. 3).
3. Remove the TB wires (pos. 7). Take note of their position.
4. Use a socket wrench to loosen and remove the nuts (pos. 8) fastening the board.
5. Remove the board.

c) Installation

6. Be sure the new keyboard PCB is functioning.
7. In order to install the new board, perform the removing operation in reverse order.

8.8.3 Trackball Replacement

a) Required Tools

- . Set of screwdrivers.

b) Removing (fig. 8.8.4)

1. By following the procedure of Para 8.8.1, remove the Keyboard Unit cover.
2. Remove the connector (pos. 10) of the Trackball (pos. 1).
3. Use a screwdriver to loosen and remove the screws (pos. 9) fastening the Trackball.
4. Remove the Trackball.

c) Installation

5. In order to install the new Track Ball, perform the removing operation in reverse order.

8.8.4 Keyboard Panel Replacement

In case of Keyboard Panel failure, refer to Para 8.3.2 Troubleshooting Operations.

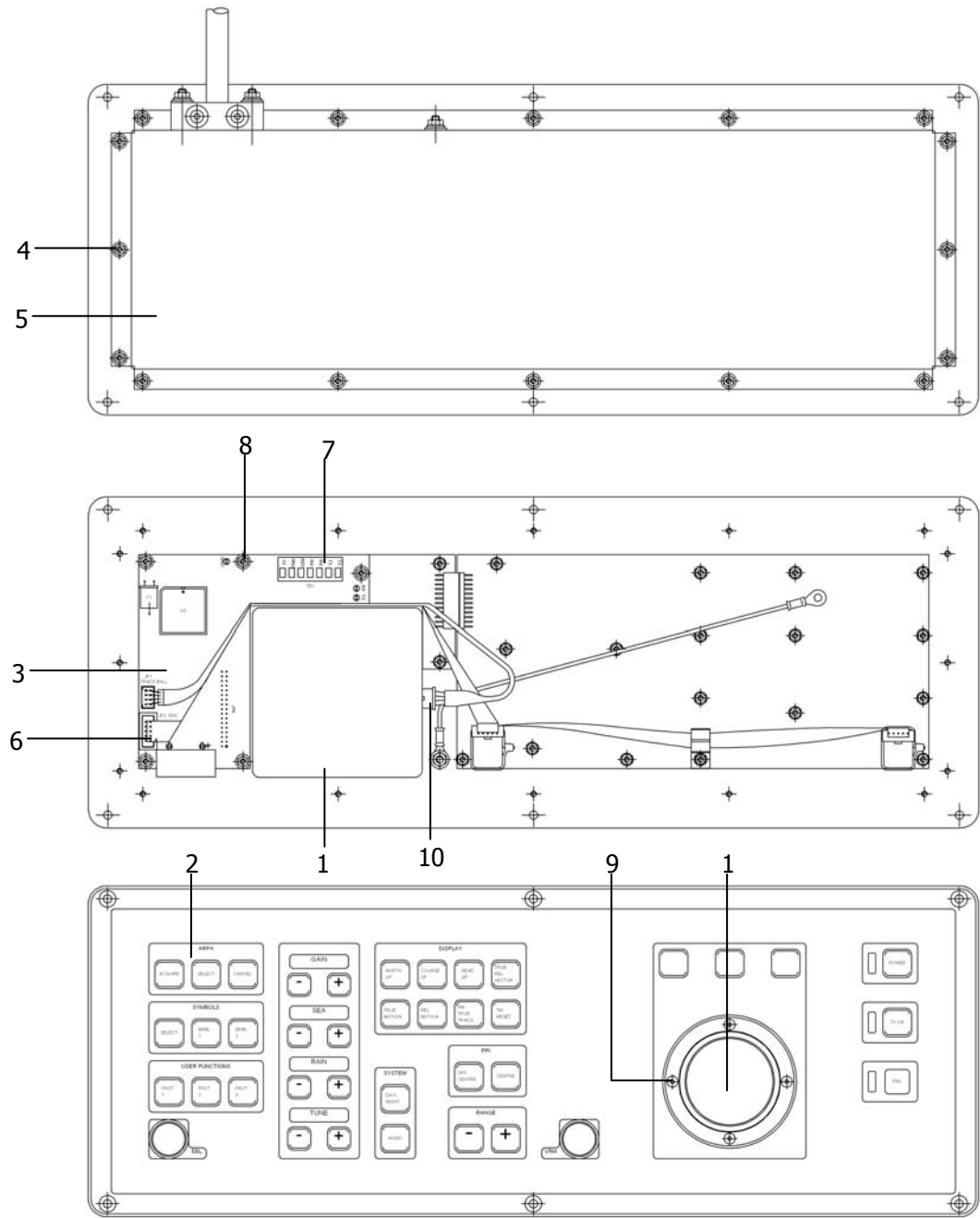


Figure 8.8.4 Keyboard Unit

8.9 PARTS LIST

8.9.1 Introduction

This chapter provides a list of the replaceable parts.

8.9.2 Parts List

The parts list is divided into major assemblies. All parts attached to the assemblies are listed in Parts List Tables. The Parts List Tables consist of several columns as follows:

- Column 1: POS. (Position): the column reports the replaceable parts position in the reference figure.
- Column 2: DESCRIPTION: the column includes the descriptive identification data of the replaceable part.
- Column 3: DRAWING SPECIFICATION NUMBER OR TYPE: the column reports the drawing specification number or the type of the replaceable part assigned by the supplier.
- Column 4: REQUIRED QUANTITY (N): the column indicates, for each replaceable part, how many of them are assembled on the equipment.

8.9.3 Part Location Illustration

The following Figures provide the location of the components. Each figure is relevant to a Replaceable Parts List table. The position numbers of items shown in the figures are referenced in the related Parts List Tables.

8.9.4 Parts List Tables**Table 8.9.1 - List of the Units (Figure 8.9.1)**

POS.	DESCRIPTION	DRAWING SPECIFICATION NUMBER OR TYPE	REFER TO
1	19" MMD SER 1ACRAL9011	000-10632-001	
1	23.1" MMD SER 1ACRAL9011, LED Backlight	000-10633-001	
1	27" MMD SER 1ACRAL9011, Wide Screen	000-10634-001	
2	Core unit for Argus 120/240 VAC w/DOCS	000-10330-001	
3	Expanded Control Panel for Argus	000-10335-001	

Table 8.9.2 - List of Items of Expanded Control Panel (Figure 8.8.4)

POS.	DESCRIPTION	DRAWING SPECIFICATION NUMBER OR TYPE	REQUIRED QUANTITY (N)
1	Trackball for Expanded Keyboard	000-10687-001	1
2	Expanded Keyboard Keypad	000-10685-001	1
3	Expanded Keyboard PCB	000-10686-001	1

Table 8.9.3 List of Items of Core unit

POS.	DESCRIPTION	DRAWING SPECIFICATION NUMBER OR TYPE	REQUIRED QUANTITY (N)
3 (Figure 8.6.4)	6.3 A Fuse for ALPHA Board (F2 – F3)		2
3 (Figure 8.6.3)	ANTARES ASSY	000-10688-001	1
2 (Figure 8.6.4)	ALPHA PCB ASSY	000-10691-001	1
2 (Figure 8.6.2)	ALPHA EXPANSION PCB ASSY	000-10690-001	1
2 (Figure 8.6.5)	Line Filter	68F149P004	1
3 (Figure 8.6.5)	POWER SUPPLY ELECTRONIC UNIT	000-10689-001	1

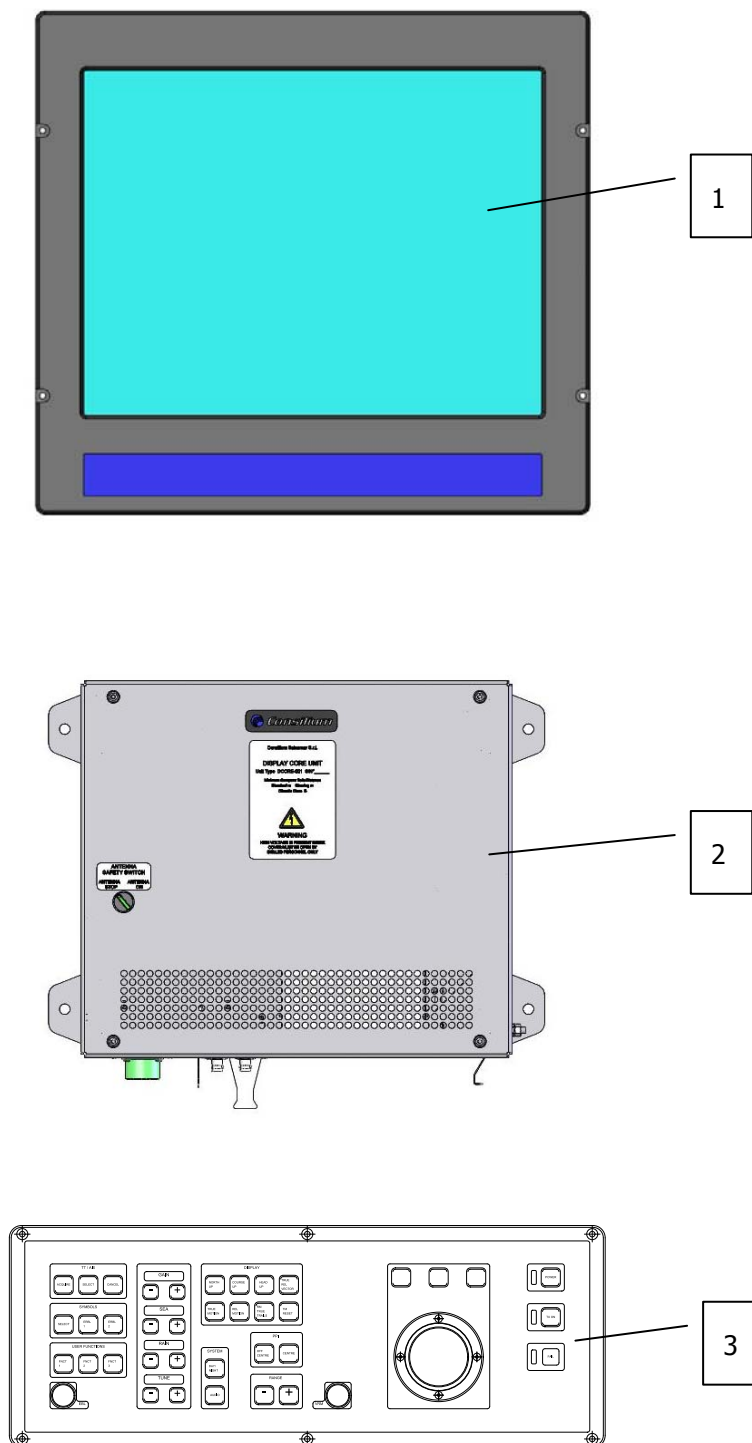


Figure 8.9.1 ARGUS Units

8.9.5 System's Lifetime

- Column 5: LIFETIME: the column indicates the lifetime for replaceable part.

Table 8.9.4 List of the Lifetime of ARGUS Units

POS.	DESCRIPTION	DRAWING SPECIFICATION NUMBER OR TYPE	REFER TO	LIFETIME K Hours
1	19" MMD SER 1ACRAL9011	000-10632-001		50
1	23.1" MMD SER 1ACRAL9011, LED BACKLIGHT	000-10633-001		50
3	POWER SUPPLY ELECTRONIC UNIT	000-10689-001	1	48

Table 8.9.5 List of Lifetime of SRT Transceiver and SRT Pedestal

POS.	DESCRIPTION	DRAWING SPECIFICATION NUMBER OR TYPE	REQUIRED QUANTITY (N)	LIFETIME K Hours
1	12&25 kW SRT Gear Reducer	000-10682-001	1	20
1	12&25 kW Motor	000-10683-001	1	20
2	SRT Transmission Gear Assy	000-10744-001	1	40
3	SRT Transmission Bearing 90 x 55 x 18	000-10745-001	1	40
4	SRT Transmission Bearing 95 x 60 x 18	000-10746-001	1	40
5 A	12KW Magnetron JRC MSF1425A	000-10676-001	1	12 *
5 C	25KW Magnetron JRC MSF1475A	000-10677-001	1	7 *

**Estimated, depending of use*

Warning

All components indicated in the Table should be replaced before the expected lifetime expires.

CHAPTER 9 INSTALLATION

9.1 INTRODUCTION

This chapter may function as a self-contained Installation Manual for the **ARGUS 19" Display and ARGUS 23.1" Display**. It contains necessary information, pictures and drawings to handle, assemble and install this unit as a part of the complete Radar system. How to prepare this unit for the Radar System Setup Procedure is also described.

9.1.1 Shipping

The following general rules apply:

- Inspection for damage during transport
- When the unit(s) arrive at destination, inspection should be made immediately to register any damage that may have occurred during transport
- The customer is normally responsible for insurance during transportation. If any damage is found, both the insurance company and the shipping agent must be informed immediately

9.1.2 Unpacking

The unit parts are placed in cardboard boxes covered with a plastic sheet. Each box includes a protecting polyurethane box shaped for the contained parts.

The following rules should be observed:

- Units must be transferred on board still packed into their boxes
- When the units are removed from their boxes, they must be left in their protective plastic cover until installation

It is advisable to keep the packing material for possible future use. The plastic sheet the unit is wrapped in, can be used to protect it during installation and maintenance procedures.

In addition to the various main parts, the package should also include:

- Technical Manual with Installation procedures
- Installation Kit (Terminals, clamps, connectors etc.)
- Standard Spare Part Kit (Fuses, screws, etc.)

The Installation Kit and the Spare Part Kit are necessary for the installation and operation of the

equipment, and must be kept together to perform the installation work. Contents of the Kits should be checked immediately after unpacking, using the supplied material list in the box. The manufacturer will not accept claims for missing items unless presented immediately after unpacking.

9.1.3 Storage

After the material contained in the boxes have been inspected in the presence of the customer and have been verified that no damage has occurred, the unit shall be stored in its original packing until the time of installation. The storage premises must be dry and well protected.

If the units must be kept in storage for more than one month, it is advisable to insert hygroscope substances, such as silicon gel salts, in the crates. See Para. 9.2, Specification (Environmental Conditions).

9.1.4 Handling

The ARGUS RADAR SYSTEM contains delicate electronic components, please handle accordingly.

9.2 SYSTEM SPECIFICATIONS

9.2.1 Dimensions and weights

See outline drawings

9.2.2 Power

Power supply	Single phase 230 or 115 Vac +/- 15% 50/60 Hz
Power consumption	65 W Monitor + Core Unit + Keyboard

9.2.3 Environmental Data

Unit Category (Monitor + Core Unit + Keyboard)	Protected
Operating temperature	-15°C to +55°C
Storage temperature	-25°C to +70°C
Relative humidity	Up to 95% at +40°
Water resistance, Salt spray, Vibrations etc..	as per IEC 60945

ARGUS RADAR

Installation

Feature	Characteristics	
Speed For	Electronic input (switch):	- PRR: 120 pulses/m, 20000 pulses/NM - Load: $\geq 1 \text{ K}\Omega$ - Pulse width: 0.1 μs (min) - Voltage: TTL to 15 V (typ)
Speed Serial	Electronic input (serial):	- Input type: RS422 standard NMEA or RS 232 - Load: $\geq 3 \text{ K}\Omega$, terminated 120 Ω
System Failure (FAIL) TB1 (pin 5-6)	Relay output NC	Closed when the system is in failure or switched off - Max 125 V 30 W load
Danger Target (DGT) TB1 (pin 3-4)	Relay output NC/NO configurable	Active when a Radar Target or AIS is dangerous - - Max 125 V 30 W load
Dead Man Alarm Reset (DNA) TB1 (pin 1-2)	Relay output NC/NO configurable	Active when an action is made on the control panel - Max 125 V 30 W load
Video and Combined data without ALPHA Expansion or CH3 and CH4 with this card		- Voltage value: 0,8 to 1,5 Vpp adjustable - Load: $\geq 1 \text{ K}\Omega$, terminated 75 Ω
Video and data with Alpha Expansion CH1 and CH2: (Optional)		
Video:	Polarity:	Positive or negative
	Amplitude:	1 to 4 Vpp adjustable
	Load:	Load: $\geq 1 \text{ K}\Omega$, terminated 75 Ω
	Bandwidth:	24 MHz (-3 dB)
Trigger:	Polarity:	Positive or negative
	Amplitude:	TTL to 40 V (peak)
	Load:	Load: $\geq 1 \text{ K}\Omega$, terminated 75 Ω
	PRF:	300 to 4000 Hz
	Pulse width:	50 ns (min.)

TABLE 9.3.1 - SUMMARY OF THE INPUT/OUTPUT REQUIREMENTS (Cont.)

Feature	Characteristics	
Serial Interface:	Signal Standard:	. RS232 or RS422 . Load: $\geq 3\text{ K}\Omega$, terminated 120 Ω
Antenna Rotation	Rotation rate:	. 20 and 40 RPM
Data	Device type:	
	- Bearing	. Voltage value: 4 to 50 V . 128 or 132 pulses per antenna revolution . Load: $\geq 2\text{ K}\Omega$
	- Encoder	. Voltage value: 4 to 50 V . 1024 or 4096 pulses per antenna revolution . Load: $\geq 2\text{ K}\Omega$
Heading line	Voltage value:	. 4 to 50 V
	Load:	. Load: $\geq 2\text{ K}\Omega$
	Pulse width:	. $\geq 0,1\text{ mS}$ and $< 45^\circ$
	Polarity:	. Positive or negative or bipolar

9.4 GUIDELINES FOR THE INSTALLATION OF SHIPBORNE RADAR EQUIPMENT

Information provided by radar is of vital importance for navigators and the safe navigation of ships.

Special care should be taken to ensure correct installation of the radar, in order to obtain the best performance of the radar system.

Correct location of the radar antenna is an important factor for the performance of the radar system. Interference, either by reflecting constructions or other transmitters, may heavily reduce the radar performance by creating blind sectors, clutter on the radar display or generation of false echoes.

9.4.1 Interference

Proper care should be taken with regard to the location of radar antennas relative to other antennas, which may cause interference to either equipment. The location of the antenna should comply with the following:

The radar antenna should be installed safely away from interfering high-power energy sources and other transmitting and receiving radio antennas.

The lower edge of a radar antenna should be a minimum of 50 cm above any safety rail.

Radar antennas in close proximity should have a minimum vertical elevation separation angle of 20° and a minimum vertical separation of 1 m where possible.

9.4.2 Location relative to masts, funnels and other constructions

Proper care should be taken with regard to the location of radar antennas relative to masts, funnels and other constructions.

The location of the antenna should comply with the following:

The antenna should generally be mounted clear of any structure that may cause signal reflections.

Ensure that any support or other obstacles are clear of the rotation of the antenna (see specific antenna outline drawing for radius of rotation).

Install antenna and turning unit so that the installation complies with the compass safe distance for the equipment.

9.4.3 Blind sectors and range

To make full benefit from the radar, it is vitally important for the OOW that horizontal and vertical blind sectors for the radar antennae are minimized. The objective is to see the horizon freely through 360° or as close to as possible.

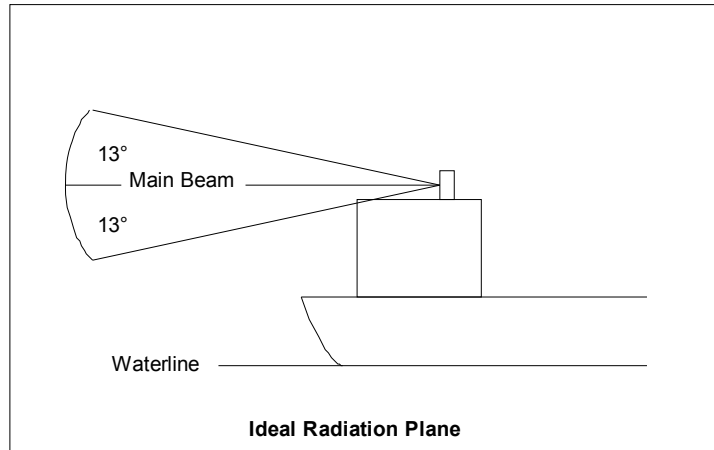
ARGUS RADAR

Installation

For all radar systems and where practical, a line of sight from the radar antenna to the bow of the ship should hit the surface of the sea at not more than 500 m or twice the ship's length, depending on which value is smaller, for all load and trim conditions.

The radar antenna should be located in an elevated position to permit maximum target visibility.

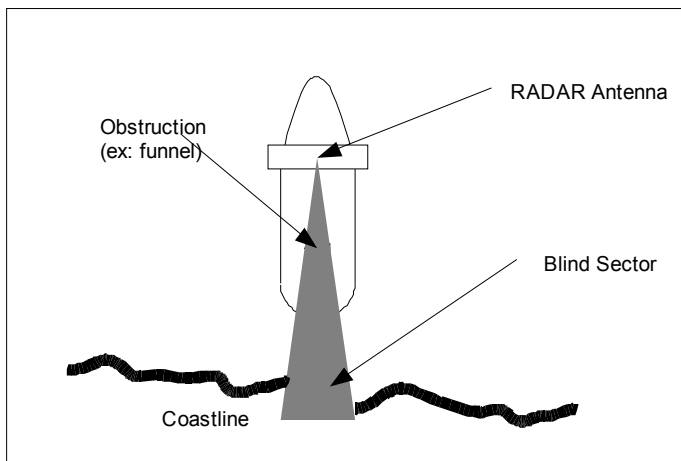
Blind sectors should be kept to a minimum, and should not occur in an area of the horizon from right ahead to 22.5° abaft the beam to either side.



Note: Any two blind sectors separated by 3° or less should be treated as one blind sector.

Individual blind sectors of more than 5°, or a total of blind sectors of more than 20°, should not occur in the remaining area.

For radar installations with two radar systems, the antennas should be placed so blind sectors are minimized.



All installations should facilitate protection of cabling and equipment from damage. Safe service access should be provided using service platforms where necessary, having a minimum size of 1 m at a suitable height and with a safety rail of suitable height.

Consideration should be given to the compass safety distance as specified by the manufacturer, when positioning the various units.

The design of the mounting platform for the antenna and antenna pedestal should take into account the vibration requirements of resolution A.694 (17) and furthermore defined by IEC 60945. In addition to vibration, the design of the mounting platform should consider shock and whiplash due to seagoing conditions.

9.4.4 Interaction with sea and false echoes

Considerations of interaction with the sea imply that the radar antenna should be only as high as necessary to clear major objects, and as high to be consistent with other requirements regarding

acceptable horizon and target detection range. The location of the antenna should minimize sea clutter returns and the-number of multi-path nulls.

9.4.5 Cables and grounding

The cables and the grounding should comply with the following:

Cable screens, especially coaxial cable screens, should be installed in accordance with manufacturer's documentation.

The cables should be kept as short as possible to minimize attenuation of the signal.

All cables between antenna and radar system units should be routed as directly as possible, consistent with consideration for other equipment, in order to reduce electromagnetic interference. Cables should not be installed close to high-power lines, such as radar or radio-transmitter lines.

Crossing of cables should be done at right angles (90°) to minimize magnetic field coupling.

All outdoor installed connectors should be waterproof by design to protect against water penetration into the cables.

Cables and microwave transmission lines should not be exposed to sharp bends.

Cables and microwave transmission lines should be installed with sufficient physical separation, as defined in the manufacturer's documentation.

9.4.6 Radar controls and display

If the control panel is a separate unit, the functionality of the radar controls should be available for the mariner at all workstations where a radar display is available.

The orientation of the display unit should be such that the user is looking ahead. The lookout view should not be obscured and the ambient light should cause minimum degradation on the display screen in accordance to MSC/Circ.982.

9.5 ARGUS DISPLAY SERIAL INTERFACE SPECIFICATION

9.5.1 Serial Line 1

It is possible to receive RS422 or RS232 standard signal at 4800 or 38400 bps indifferently on TB9 (FNMEA 1). Note that the circuit is able to receive at 4800 and 38400 bps also with RS232 connection, but this is not a standard connection according to the IEC 61162-2 standard.

RS 422 Interface Listener Connection

+ IN_1	. "A" Data Input
- IN_1	. "B" Data Input
SHLD_1	. "C" insulated Ground
Input Load	. $\geq 7K\Omega$

RS 232 Interface Listener Connection

- IN_1	. RX Data Input
SHLD_1 and + IN_1	. Insulated ground
Input Load	- $\geq 7K\Omega$

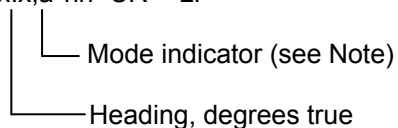
This serial line is in compliance with IEC 61162-1 and IEC 61162-2.
Accepted sentences: THS and HDT.

THS – True heading and status

NOTE This sentence replaces the deprecated sentence HDT.

Actual vessel heading in degrees true produced by any device or system producing true heading. This sentence includes a "mode indicator" field providing critical safety related information about the heading data, and replaces the deprecated HDT sentence.

\$--THS,x.x,a*hh<CR><LF>



NOTE Mode indicator. This field should not be null.

A = Autonomous

E = Estimated (dead reckoning)

M = Manual input

S = Simulator mode

V = Data not valid (including standby)

HDT – Heading true

Actual vessel heading in degrees true produced by any device or system producing true heading.

NOTE This is a deprecated sentence which has been replaced by THS.

\$--HDT, x.x, T*hh<CR><LF>

└───┘ Heading, degrees true

9.5.2 Serial Line 2

It is possible to receive RS422 or RS232 standard signal at 4800 and 38400 bps on TB8 (FNMEA 2). Note that the circuit is able to receive at 4800 and 38400 bps also with RS232 connection, but this is not a standard connection according to the IEC 61162-2 standard.

RS 422 Interface Listener Connection

+ IN_2	. "A" Data Input
- IN_2	. "B" Data Input
SHLD_2	. "C" insulated Ground
Input Load	. $\geq 7K\Omega$

RS 232 Interface Listener Connection

- IN_2	. RX Data Input
SHLD_2 and + IN_2	. Insulated ground
Input Load	$\geq 7K\Omega$

RS 422 Output Talker Connection

+ OUT_2	. "A" Data Output
- OUT_2	. "B" Data Output
GND	. "C" Ground
Output Drive	150 mA

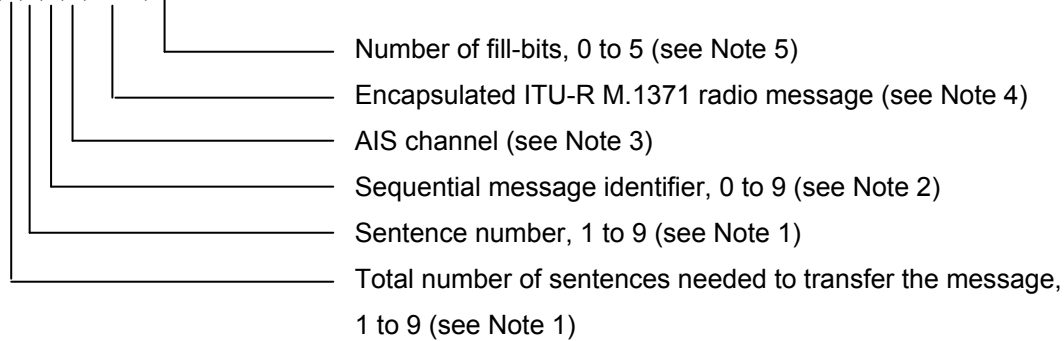
This serial line is in compliance with IEC 61162-1 and IEC 61162-2. Accepted sentences: VDM, VDO and AIS ALR. Send sentences: TLB, TTD and ACK.

VDM – AIS VHF data-link message

Defined in ITU-R M.1371 and as received on the VHF Data Link (VDL), using the “six-bit” field type. The structure provides for the transfer of long binary messages by using multiple sentences.

Data messages should be transmitted in as few sentences as possible. When a data message can be accommodated in a single sentence, then it shall not be split.

!-VDM,x,x,x,a,s—s,x*hh<CR><LF>



NOTE 1 The length of an ITU-R M.1371 message may require the transmission of multiple sentences. The first field specifies the total number of sentences used for a message, minimum value 1. The second field identifies the order of this sentence in the message, minimum value 1. These cannot be null fields.

NOTE 2 The sequential message identifier provides a message identification number from 0 to 9 that is sequentially assigned and is incremented for each new multi-sentence message. The count resets to 0 after 9 is used. For a message requiring multiple sentences, each sentence of the message contains the same sequential message identification number. It is used to identify the sentences containing portions of the same message. This allows for the possibility that other sentences might be interleaved with the message sentences that, taken collectively, contain a single message. This should be a null field for messages that fit into one sentence.

NOTE 3 The AIS channel is indicated as either “A” or “B”. This channel indication is relative to the operating conditions of the AIS unit when the packet is received. This should be a null field when the channel identification is not provided. The VHF channel numbers for channels “A” and “B” are obtained by using a “query” of the AIS unit for an ACA sentence.

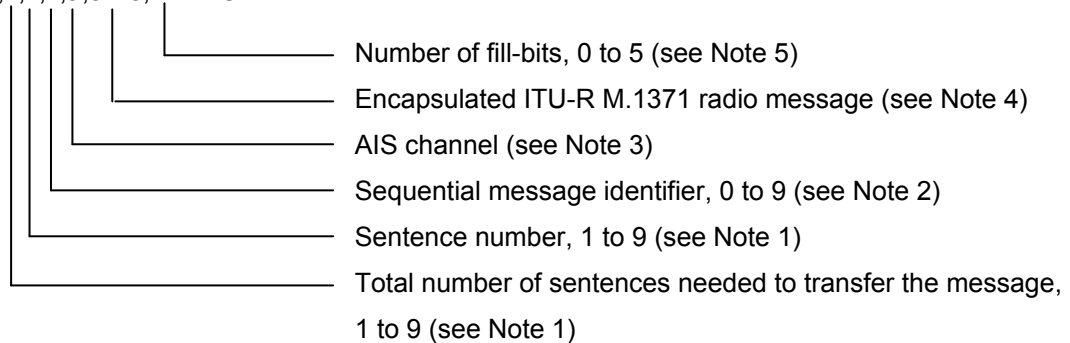
NOTE 4 This field supports up to 60 valid characters. Under certain conditions, this field may support up to a maximum of 62 valid characters: 1) When the message can be transmitted using a single sentence, the sequential message identifier field is set to null allowing an additional valid character in this encapsulated field. 2) When the AIS channel field is set to null an additional valid character is allowed in this encapsulated field. 3) The maximum number of 62 valid characters is only possible when the conditions allow both the sequential message identifier and AIS channel fields is set to null.

NOTE 5 This cannot be a null field.

VDO – AIS VHF data-link own-vessel report

This sentence is used to transfer the entire contents of an AIS unit's broadcast message packet, as defined in ITU-R M.1371 and as sent out by the AIS unit over the VHF data link (VDL) using the "six-bit" field type. The sentence uses the same structure as the VDM sentence formatter.

!-VDM,x,x,x,a,s-s,x*hh<CR><LF>

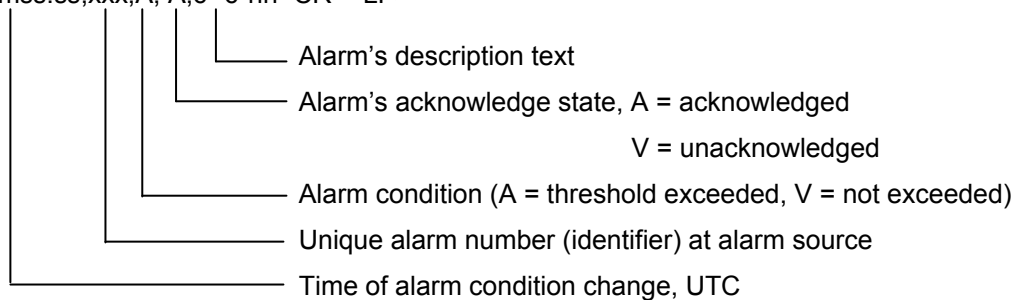


NOTES 1 to 5 See VDM sentence notes.

ALR – Set alarm state

Local alarm condition and status. This sentence is used to report an alarm condition on a device and its current state of acknowledgement.

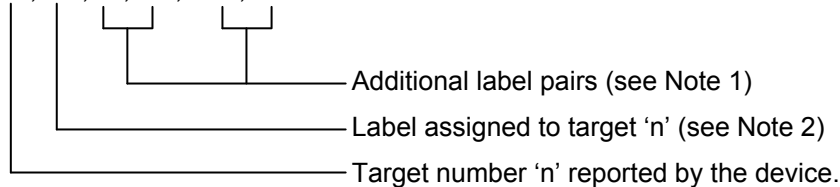
\$-ALR,hhmmss.ss,xxx,A, A,c--c*hh<CR><LF>



TLB – Target label

Common target labels for tracked targets. This sentence is used to specify labels for tracked targets to a device that provides tracked target data (e.g. via the TTM – Tracked target message). This will allow all devices displaying tracked target data to use a common set of labels (e.g. targets reported by two radars and displayed on an ECDIS).

\$--TLB,x,x,c--c,x,x,c--c,...x,x,c--c*hh<CR><LF>



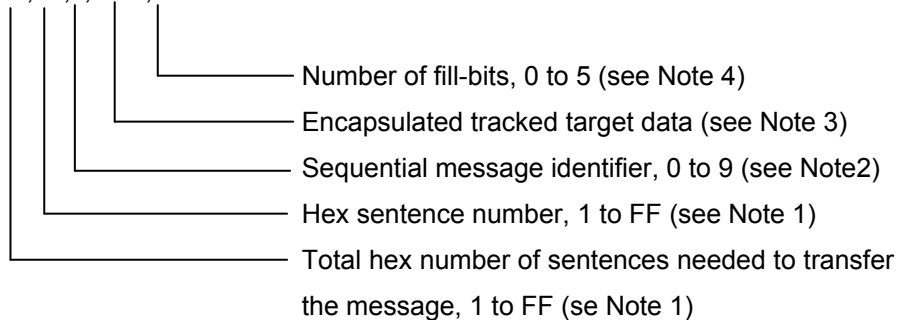
NOTE 1 This sentence allows several target number/label pairs to be sent in a single message, the maximum sentence length limits the number of labels allowed in a message.

NOTE 2 Null fields indicate that no common label is specified, not that a null label should be used. The intent is to use a null field as a place holder. A device that provides tracked target data should use its "local" label (usually the target number) unless it has received a TLB sentence specifying a common label.

TTD – Tracked target data

This sentence is used to transmit tracked radar targets in a compressed format. This enables the transfer of many targets with minimum overhead. New target labels are defined by the TLB sentence to reduce use of bandwidth. Transmission of up to four targets in the same sentence is possible.

!--TTD,hh,hh,x,s--s,x*hh<CR><LF>



NOTE 1 The transfer of all tracked targets may require the transmission of multiple sentences. The first field specifies the total number of sentences used for a message, minimum value 1. The second field identifies the order of this sentence in the message, minimum value 1. These cannot be null fields.

NOTE 2 The sequential message identifier provides a message identification number from 0 to 9 that is sequentially assigned and is incremented for each new multi-sentence message. The count resets to 0 after 9 is used. For a message requiring multiple sentences, each sentence of the message contains the same sequential message identification number. It is used to identify the sentences containing portions of the same message. This allows for the possibility that other sentences might be interleaved with the message sentences that, taken collectively, contain a single message. This should be a null field for messages that fit into one sentence.

NOTE 3 The tracked target data structure is described below. One sentence may contain from one up to four structures of 15 characters in the same sentence. This field supports a maximum of 60 valid characters for messages transferred using multiple sentences.

NOTE 4 This cannot be a null field. See "x4" in description of encapsulation sentences in IEC 61162-1. Every target (tracked or AIS) is packed according to the structure below. Data is stored most significant bit first. Every message character is converted into six bits. The structure is encapsulated as 15 characters. The sentence may contain from one to four targets.

9.5.3 Serial Line 3

It is possible to receive RS422 or RS232 standard signal at 4800 or 38400 bps indifferently on TB3 (FNMEA 3). Note that the circuit is able to receive at 4800 and 38400 bps also with RS232 connection, but this is not a standard connection according to the IEC 61162-2 standard.

RS 422 Interface Listener Connection

+ IN_3	. "A" Data Input
- IN_3	. "B" Data Input
SHLD_3	. "C" insulated Ground
Input Load	. $\geq 7K\Omega$

RS 232 Interface Listener Connection

- IN_3	. RX Data Input
SHLD_1 and + IN_3	. Insulated ground
Input Load	$\geq 7K\Omega$

RS 422 Output Talker Connection

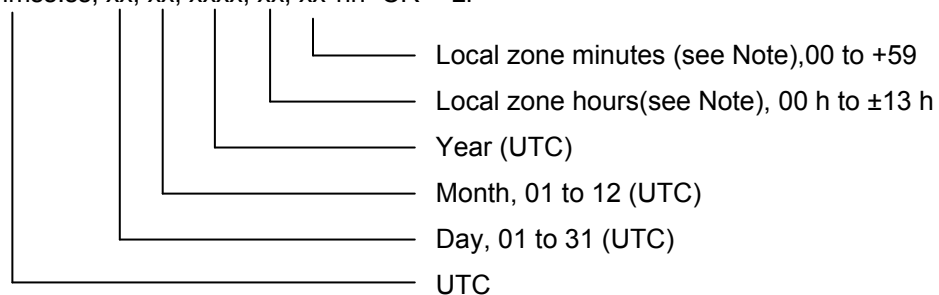
+ OUT_3	. "A" Data Output
- OUT_3	. "B" Data Output
GND	. "C" Ground
Output Drive	150 mA

This serial line is in compliance with IEC 61162-1 and IEC 61162-2. Accepted sentences: ZDA, GLL, GGA, GNS, RMC and ACK. Send sentences: OSD, RSD and TTM.

ZDA – Time and date

UTC, day, month, year and local time zone.

\$--ZDA, hhmmss.ss, xx, xx, xxxx, xx, xx*hh<CR><LF>

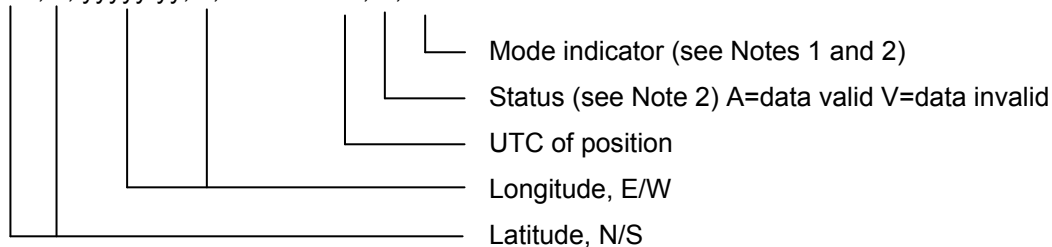


NOTE Local time zone is the magnitude of hours plus the magnitude of minutes added, with the sign of local zone hours, to local time to obtain UTC. Local zone is generally negative for East longitudes with local exceptions near the International date line.

GLL – Geographic position – latitude/longitude

Latitude and longitude of vessel position, time of position fix and status.

\$--GLL, llll.ll, a, yyyy.yy, a, hhmmss.ss, A, a *hh<CR><LF>



NOTE 1 Positioning system mode indicator:

A = Autonomous

D = Differential

E = Estimated (dead reckoning)

M = Manual input

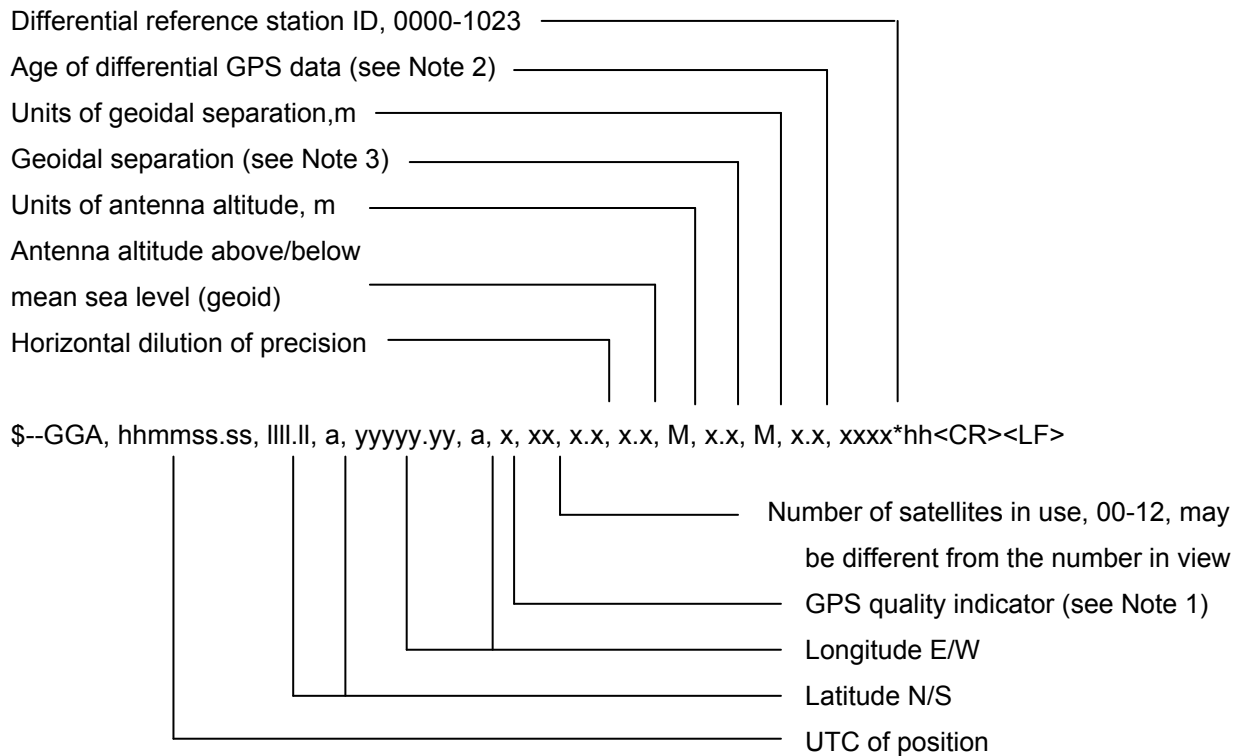
S = Simulator

N = Data not valid

NOTE 2 The mode indicator field supplements the status field (field 6). The status field should be set to V = invalid for all values of operating mode except for A = Autonomous and D = Differential. The positioning system mode indicator and status fields should not be null fields.

GGA – Global positioning system (GPS) fix data

Time, position and fix-related data for a GPS receiver.



NOTE 1 All GPS quality indicators in headings 1 through 8 are considered "valid". The heading "0" is the only "invalid" indicator. The GPS quality indicator field should not be a null field.

0 = fix not available or invalid

1 = GPS SPS mode

2 = differential GPS, SPS mode

3 = GPS PPS mode

4 = Real Time Kinematic. Satellite system used in RTK mode with fixed integers

5 = Float RTK. Satellite system used in RTK mode with floating solution

6 = Estimated (dead reckoning) mode

7 = Manual input mode

8 = Simulator mode

NOTE 2 Time in seconds since last SC104 type 1 or 9 update, null field when DGPS is not used.

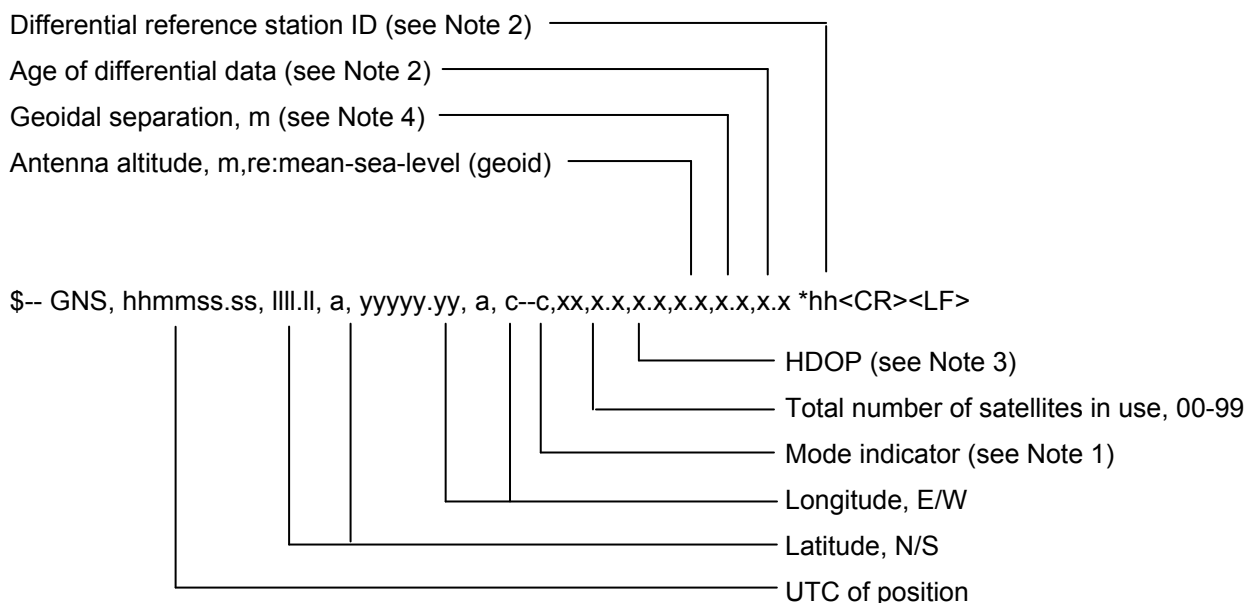
NOTE 3 Geoidal separation: the difference between the WGS-84 earth ellipsoid surface and mean sea level (geoid) surface, "–" = mean sea level surface below the WGS-84 ellipsoid surface.

GNS – GNSS fix data

Fix data for single or combined satellite navigation systems (GNSS). This sentence provides fix data for GPS, GLONASS, possible future satellite systems and systems combining these. This sentence could be used with the talker identification of GP for GPS, GL for GLONASS, GN for GNSS combined systems, as well as future identifiers. Some fields may be null fields for certain applications, as described below.

If a GNSS receiver is capable simultaneously of producing a position using combined satellite systems, as well as a position using only one of the satellite systems, then separate \$GPGNS, \$GLGNS, etc. sentences may be used to report the data calculated from the individual systems.

If a GNSS receiver is set up to use more than one satellite system, but for some reason one or more of the systems are not available, then it may continue to report the positions using \$GNGNS, and use the mode indicator to show which satellite systems are being used.



NOTE 1 Mode Indicator. A variable length valid character field type with the first two characters currently defined.

The first character indicates the use of GPS satellites, the second character indicates the use of GLONASS satellites. If another satellite system is added to the standard, the mode indicator will be extended to three characters; new satellite systems shall always be added to the right, so the order of characters in the mode indicator is: GPS, GLONASS, other satellite systems.

The characters should take one of the following values:

N = No fix. Satellite system not used in position fix, or fix not valid.

A = Autonomous. Satellite system used in non-differential mode in position fix.

D = Differential. Satellite system used in differential mode in position fix.

P = Precise. Satellite system used in precision mode. Precision mode is defined as: no deliberate degradation (such as selective availability), and higher resolution code (P-code) is used to compute position fix.

R = Real time kinematic. Satellite system used in RTK mode with fixed integers.

F = Float RTK. Satellite system used in real time kinematic mode with floating solution.

E = Estimated (dead reckoning) mode.

M = Manual input mode.

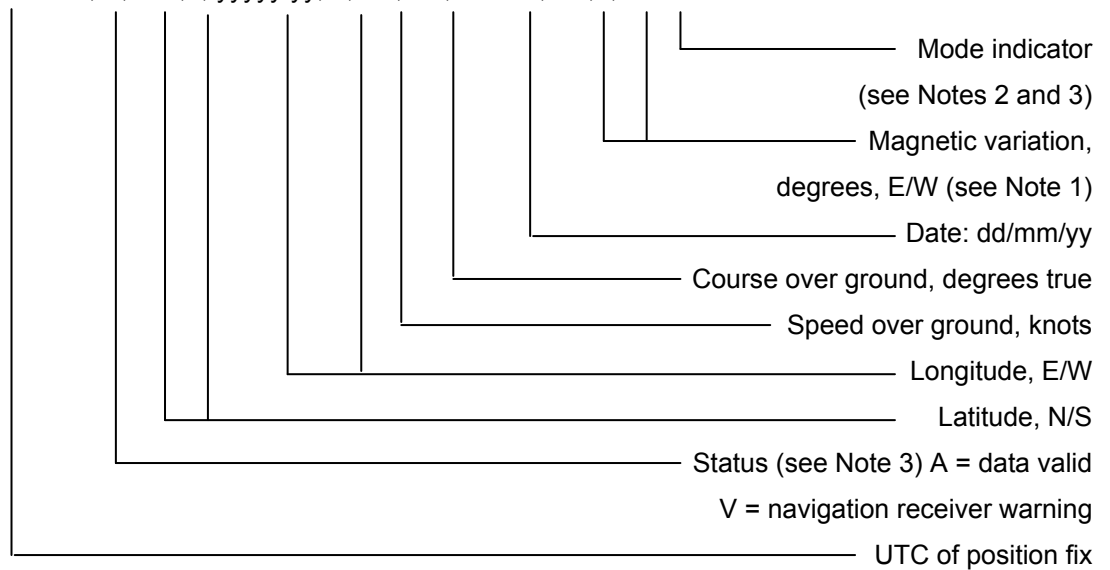
S = Simulator mode.

The mode indicator should not be a null field.

RMC – Recommended minimum specific GNSS data

Time, date, position, course and speed data provided by a GNSS navigation receiver. This sentence is transmitted at intervals not exceeding 2 s and is always accompanied by RMB when a destination waypoint is active. RMC and RMB are the recommended minimum data to be provided by a GNSS receiver. All data fields should be provided, null fields used only when data is temporarily unavailable.

```
$--RMC, hhmmss.ss, A, llll.ll,a, yyyy.yy, a, x.x, x.x, xxxxxx, x.x,a, a*hh<CR><LF>
```



NOTE 1 Easterly variation (E) subtracts from true course. Westerly variation (W) adds to true course.

NOTE 2 Positioning system mode indicator:

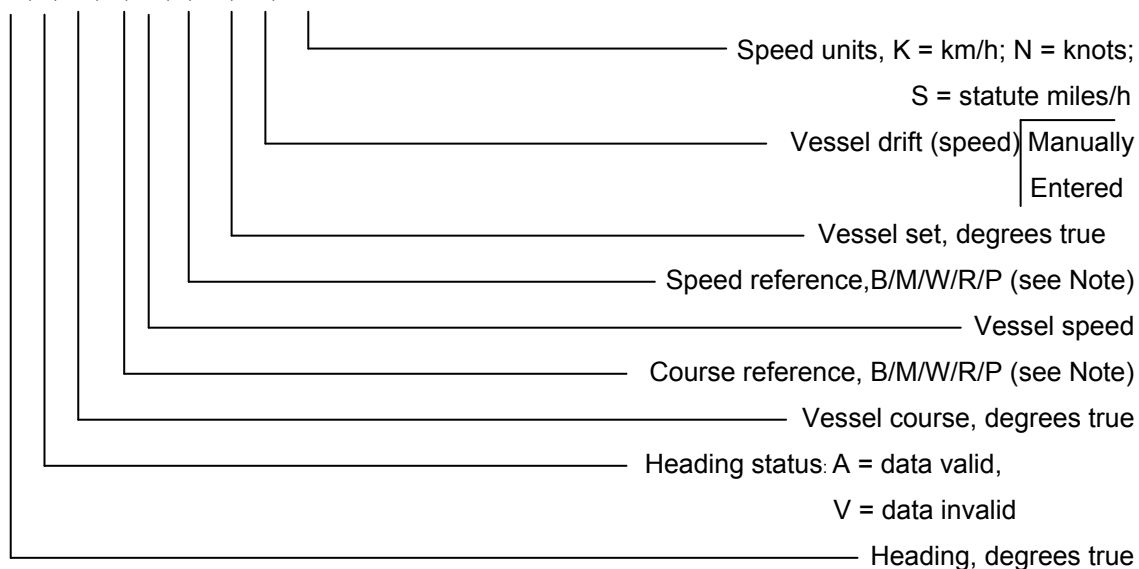
- A = Autonomous mode
- D = Differential mode
- E = Estimated (dead reckoning) mode
- M = Manual input mode
- S = Simulator mode
- N = Data not valid

NOTE 3 The positioning system mode indicator field supplements the positioning system status field (field No. 2) which should be set to V = invalid for all values of mode indicator except for A = Autonomous

OSD – Own ship data

Heading, course, speed, set and drift summary. Useful for, but not limited to radar/ARPA applications. OSD gives the movement vector of the ship based on the sensors and parameters in use.

\$--OSD, x.x,A,x.x, a,x.x,a,x.x,x.x,a*hh<CR><LF>



NOTE Reference systems on which the calculation of vessel course and speed is based. The values of course and speed are derived directly from the referenced system and do not additionally include the effects of data in the set and drift fields.

B = bottom tracking log

M = manually entered

W = water referenced

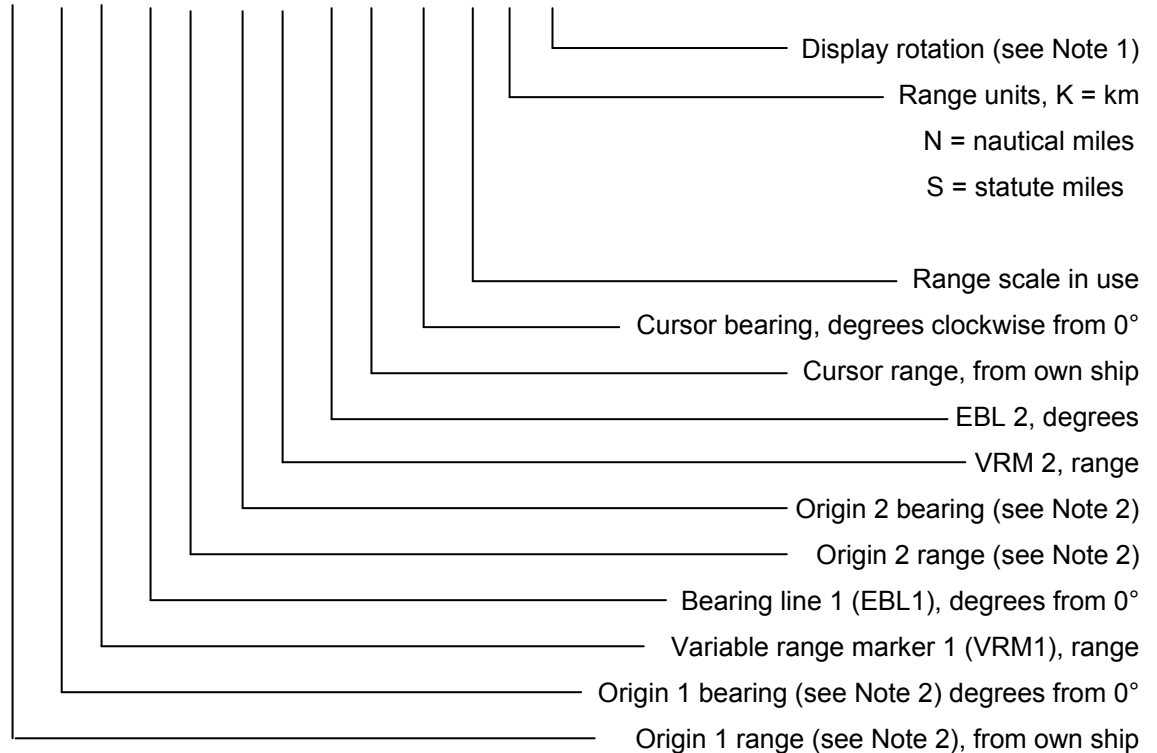
R = radar tracking (of fixed target)

P = positioning system ground reference.

RSD – Radar system data

Radar display setting data.

\$--RSD, x.x, x.x,x.x, x.x,x.x, x.x,x.x, x.x,x.x, x.x, x.x, a, a*hh<CR><LF>



NOTE 1 Display rotation:

C = course-up, course-over-ground up, degrees true

H = head-up, ship's heading (centre-line) 0° up

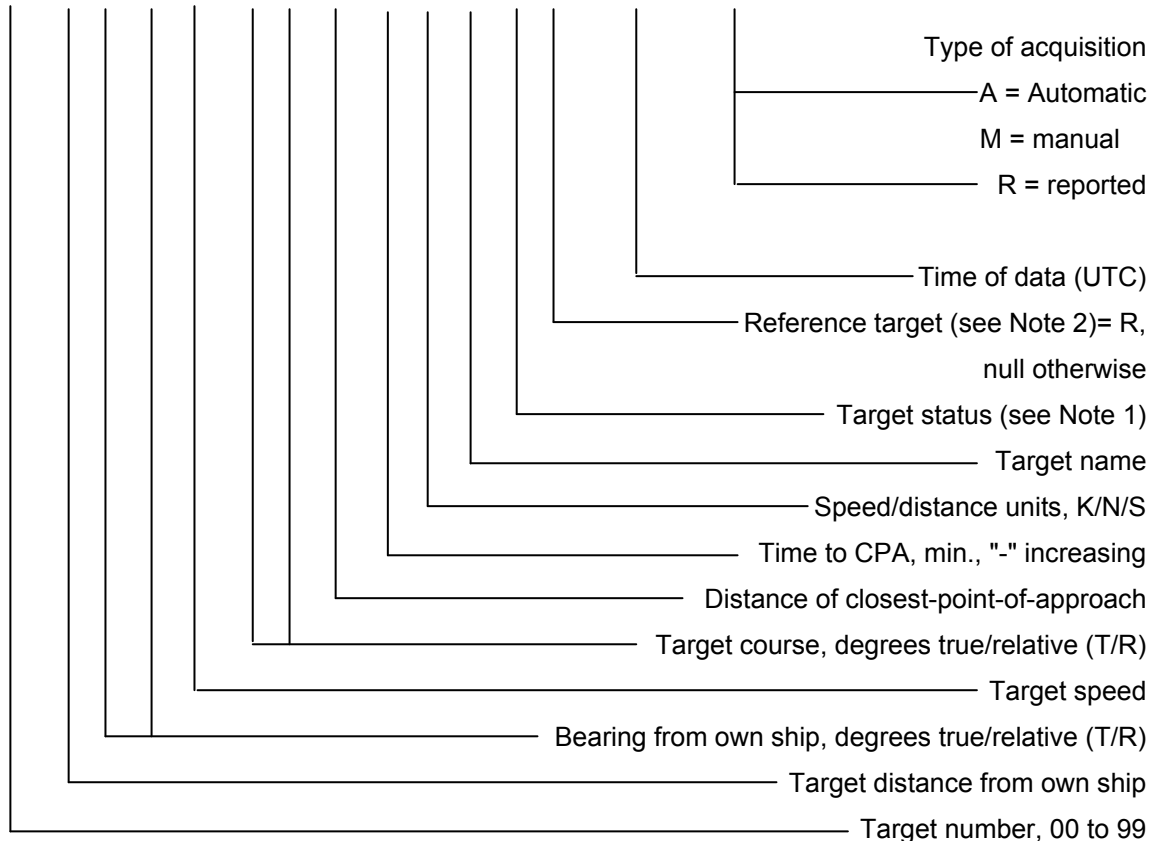
N = north-up, true north is 0° up

NOTE 2 Origin 1 and origin 2 are located at the stated range and bearing from own ship and provide for two independent sets of variable range markers (VRM) and electronic bearing lines (EBL) originating away from own ship position.

TTM – Tracked target message

Data associated with a tracked target relative to own ship's position.

\$--TTM, xx, x.x, x.x, a, x.x, x.x, a, x.x, x.x, a, c--c, a, a, hhmmss.ss, a *hh<CR><LF>



NOTE 1 Target status:

L = Lost, tracked target has been lost

Q = Query, target in the process of acquisition

T = Tracking

NOTE 2 Reference

NOTE: All the position data sent out via TTM and TTD is always relative to the CCRP

Local geodetic datum and datum offsets from a reference datum. This sentence is used to define the datum to which a position location, and geographic locations in subsequent sentences, are referenced. Latitude, longitude and altitude offsets from the reference datum, and the selection of the reference datum, are also provided.

For all datums the DTM sentence should be transmitted prior to any datum change and periodically at intervals of not greater than 30 s.

Reference datum	WGS84 = W84
Altitude offset, m (see Note 3)	WGS72 = W72
Lon offset, min, E/W (see Note 3)	SGS85 = S85
Lat offset, min, N/S (see Note 3)	PE90 = P90
Local datum subdivision code (see Note 2)	
Local datum: (see Note 1)	WGS84 = W84
	WGS72 = W72
	SGS85 = S85
	PE90 = P90
	User defined = 999
	IHO datum code (see Note 4)

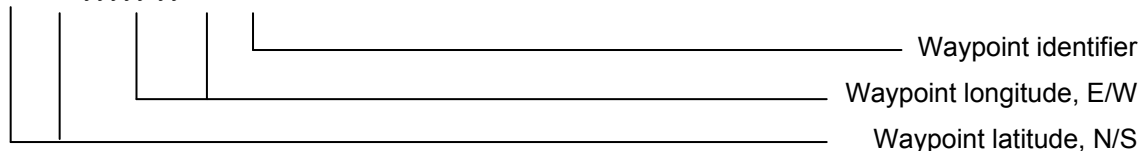
NOTE 3 Latitude and longitude offsets are positive numbers, the altitude offset may be negative. Offsets change with position: position in the local datum is offset from the position in the reference datum in the directions indicated:

NOTE 4 Users should be aware that chart transformations based on IHO S60 parameters may result in significant positional errors when applied to chart data.

WPL – Waypoint location

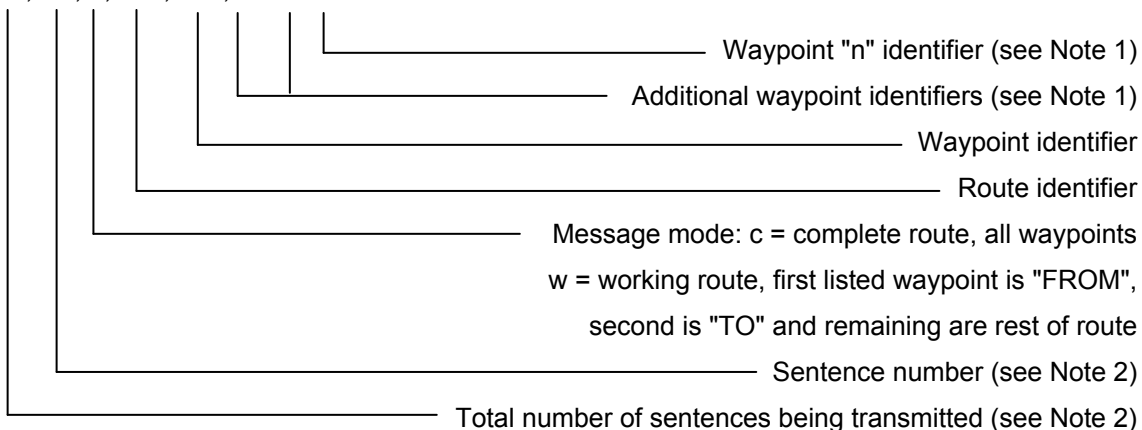
Latitude and longitude of specified waypoint.

\$--WPL, IIII.II, a, yyyyyy.yy, a, c--c*hh<CR><LF>

**RTE – Routes**

Waypoint identifiers, listed in order with starting waypoint first, for the identified route. Two modes of transmission are provided: "c" indicates that the complete list of waypoints in the route is being transmitted; "w" indicates a working route where the first listed waypoint is always the last waypoint that had been reached (FROM), while the second listed waypoint is always the waypoint that the vessel is currently heading for (TO) and the remaining list of waypoints represents the remainder of the route.

\$--RTE, x.x, x.x, a, c--c, c--c,..... c--c*hh<CR><LF>



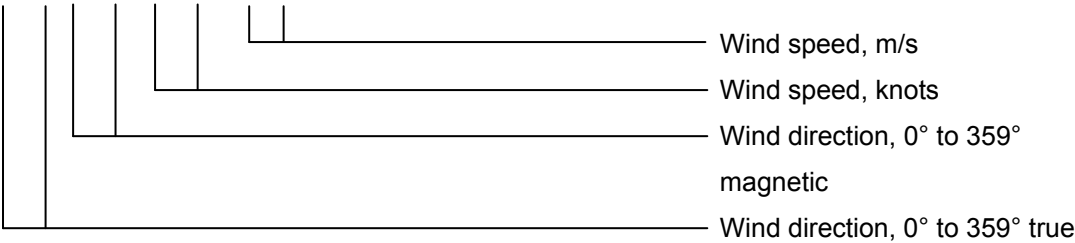
NOTE 1 A variable number of waypoint identifiers, up to "n", may be included within the limits of allowed sentence length. As there is no specified number of waypoints, null fields are not required for waypoint identifier fields.

NOTE 2 A single route may require the transmission of multiple sentences, all containing identical field formats when sending a complex message. The first field specifies the number of sentences, minimum value = 1. The second field identifies the order of this sentence (sentence number), minimum value = 1. For efficiency, it is permitted that null fields be used in the additional sentences when the data is unchanged from the first sentence. (Note that this practice can lead to the incorrect assembly of sentences if there is a high risk of loss of sentence.).

MWD – Wind direction and speed

The direction from which the wind blows across the earth’s surface, with respect to north, and the speed of the wind.

\$--MWD, x.x,T,x.x,M,x.x,N,x.x,M*hh<CR><LF>



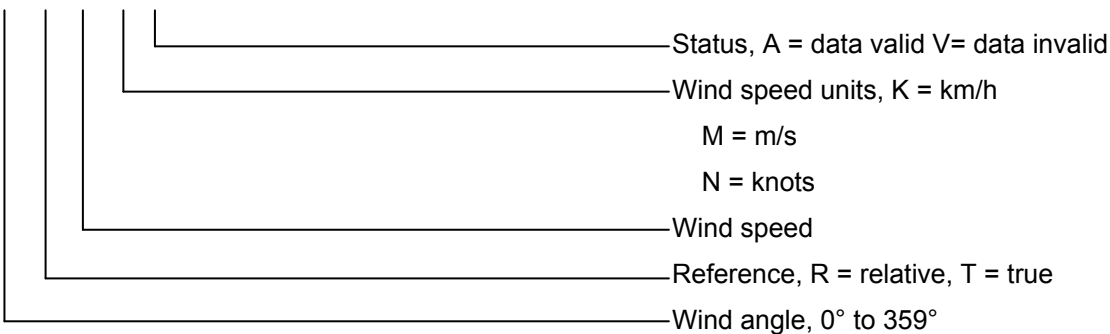
MWV – Wind speed and angle

When the reference field is set to R (Relative), data is provided giving the wind angle in relation to the vessel's bow/centreline and the wind speed, both relative to the (moving) vessel. Also called apparent wind, this is the wind speed as felt when standing on the (moving) ship. When the reference field is set to T (Theoretical/calculated wind), data is provided giving the wind angle in relation to the vessel's bow/centreline and the wind speed as if the vessel was stationary. On a moving ship, these data can be calculated by combining the measured relative wind with the vessel's own speed.

Example 1 If the vessel is heading west at 7 knots and the wind is from the east at 10 knots the relative wind is 3 knots at 180°. In this same example the theoretical wind is 10 knots at 180° (if the boat suddenly stops the wind will be at the full 10 knots and come from the stern of the vessel 180° from the bow).

Example 2 If the vessel is heading west at 5 knots and the wind is from the southeast at 7,07 knots the relative wind is 5 knots at 270°. In this same example the theoretical wind is 7,07 knots at 225° (if the boat suddenly stops the wind will be at the full 7,07 knots and come from the port-quarter of the vessel 225° from the bow).

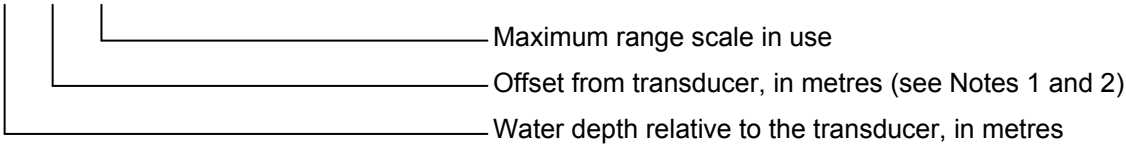
\$--MWV, x.x, a, x.x, a, A *hh<CR><LF>



DPT – Depth

Water depth relative to the transducer and offset of the measuring transducer. Positive offset numbers provide the distance from the transducer to the waterline. Negative offset numbers provide the distance from the transducer to the part of the keel of interest.

\$--DPT, x.x, x.x, x.x*hh<CR><LF>

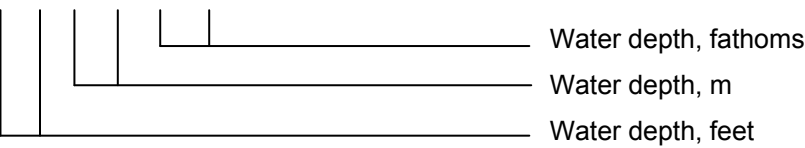


NOTE 1 “positive” = distance from transducer to water line; “-” = distance from transducer to keel.
NOTE 2 For IEC applications, the offset should always be applied so as to provide depth relative to the keel.

DBT – Depth below transducer

Water depth referenced to the transducer.

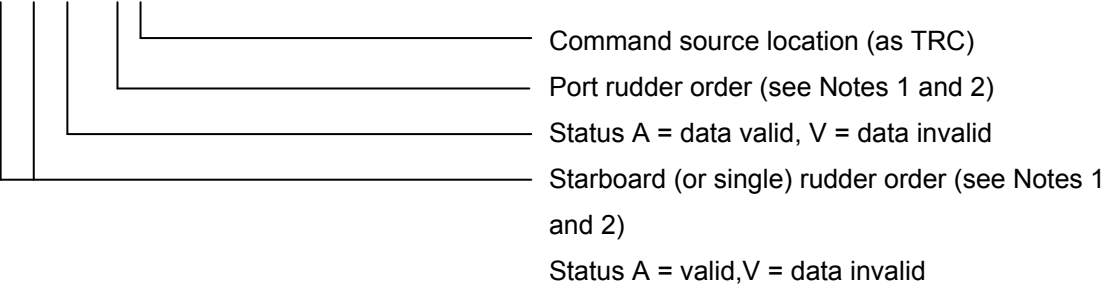
\$--DBT, x.x, f, x.x, M, x.x, F*hh<CR><LF>



ROR – Rudder order status

Angle ordered for the rudder.

\$--ROR,x.x,A,x.x,A,a*hh<CR><LF>

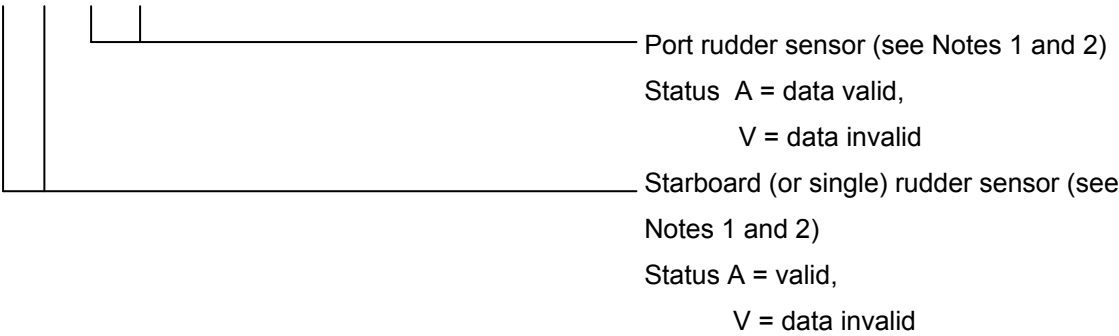


NOTE 1 Relative measurement of rudder order angle without units, “-” = bow turns to port.
NOTE 2 The status field should not be a null field.

RSA – Rudder sensor angle

Relative rudder angle,from rudder angle sensor.

\$--RSA, x.x, A, x.x, A*hh<CR><LF>

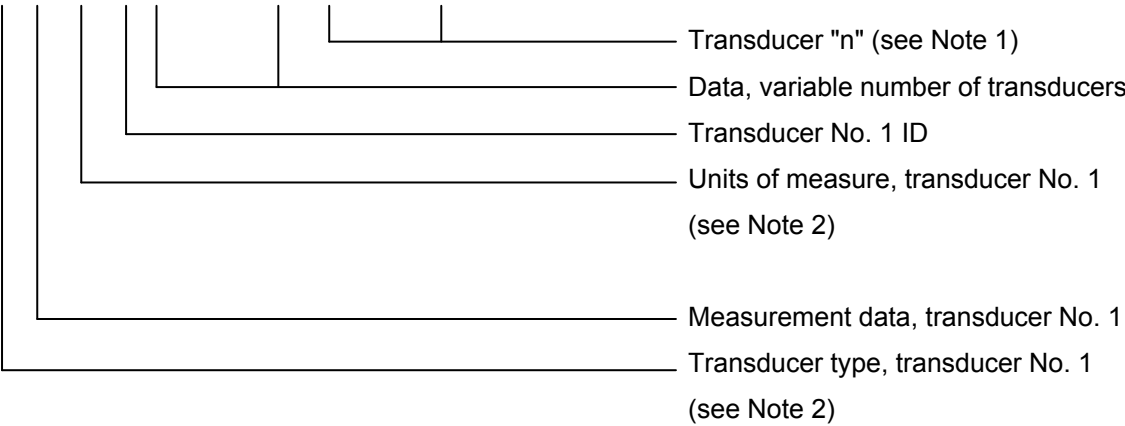


NOTE 1 Relative measurement of rudder angle without units, "-" = bow turns to port. Sensor output is proportional to rudder angle but not necessarily 1:1.
NOTE 2 The status field should not be a null field.

XDR – Transducer measurements

Measurement data from transducers that measure physical quantities such as temperature, force, pressure, frequency, angular or linear displacement, etc. Data from a variable number of transducers measuring the same or different quantities can be mixed in the same sentence. This sentence is designed for use by integrated systems as well as transducers that may be connected in a "chain" where each transducer receives the sentence as an input and adds on its own data fields before retransmitting the sentence.

\$--XDR, a, x.x, a, c--c,..... a, x.x, a, c--c*hh<CR><LF>



NOTE 1 Sets of the four fields "type-data-units-ID" are allowed for an undefined number of transducers. Up to "n" transducers may be included within the limits of allowed sentence length; null fields are not required except where portions of the "type-data-units-ID" combination are not available.
NOTE 2 Allowed transducer types and their units of measure are:

Transducer	Type field	Units	Comments
Temperature	C	C = degrees Celsius	
Angular displacement	A	D = degrees	"-" = anticlockwise
Absolute humidity	B	K = kg/m ³	Kilograms per cubic metre
Linear displacement	D	M = metre	"-" = compression
Frequency	F	H = Hertz	
Salinity	L	S = ppt	ppt = parts per thousand
Force	N	N = newtons	"-" = compression
Pressure	P	P = pascals	"-" = vacuum
Flow rate	R	l = litres/s	
Tachometer	T	R = revolutions/min	
Humidity	H	P = per cent	
Volume	V	M = cubic metres	
Voltage	U	V = volts	
Current	I	A = amperes	
Switch or valve	S	None (null)	1 = ON, CLOSED; 0 = OFF, OPEN
Generic	G	None (null)	x.x = variable data

9.5.4 Serial Line 4

It is possible to receive RS422 or RS232 standard signal at 4800 bps indifferently on TB2 (422). Note that the circuit is able to receive at 4800 bps also with RS232 connection, but this is not a standard connection according to the IEC 61162-2 standard.

RS 422 Interface Listener Connection

+ IN_4	. "A" Data Input
- IN_4	. "B" Data Input
SHLD_4	. "C" insulated Ground
Input Load	. $\geq 3 \text{ K}\Omega$

RS 232 Interface Listener Connection

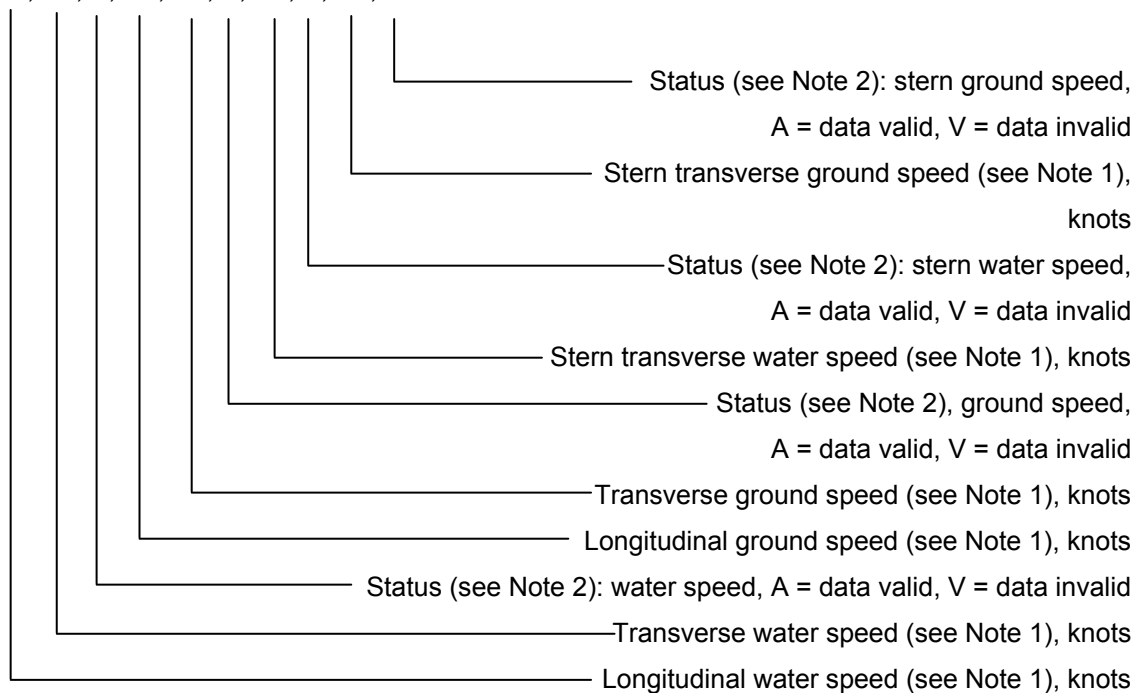
- IN_4	. RX Data Input
SHLD_4 and + IN_4	. Insulated ground
Input Load	. $\geq 3 \text{ K}\Omega$

This serial line is in compliance with IEC 61162-1 and IEC 61162-2. Accepted sentences: VBW and VHW.

VBW – Dual ground/water speed

Water-referenced and ground-referenced speed data

\$--VBW, x.x, x.x, A, x.x, x.x, A, x.x, A, x.x, A*hh<CR><LF>



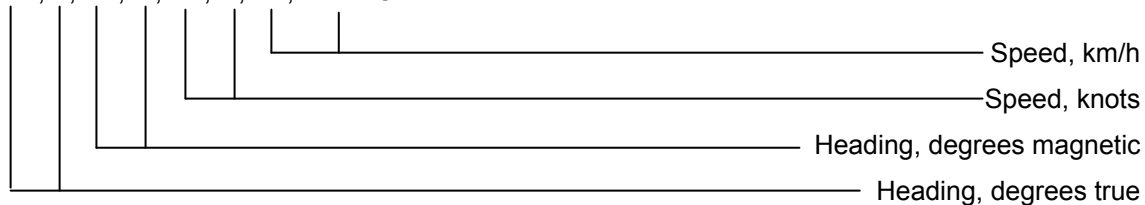
NOTE 1 Transverse speed: "-" = port,
Longitudinal speed: "-" = astern.

NOTE 2 The status field should not be a null field.

VHW – Water speed and heading

The compass heading to which the vessel points and the speed of the vessel relative to the water.

\$--VHW, x.x, T, x.x, M, x.x, N, x.x, K*hh<CR><LF>

**9.5.5 Serial Line 5**

It is possible to receive RS422 or RS232 standard signal at 2400 or 4800 bps indifferently on TB6 (232+422_2).

RS 422 Interface Listener Connection

+ IN_5	. "A" Data Input
- IN_5	. "B" Data Input
GND	. "C" Ground
Input Load	. $\geq 3\text{ K}\Omega$

RS 232 Interface Listener Connection

- IN_5	. RX Data Input
GND and + IN_5	. Ground
Input Load	. $\geq 3\text{ K}\Omega$

RS 422 Output Talker Connection

+ OUT_5	. "A" Data Output
- OUT_5	. "B" Data Output
GND	. "C" Ground
Output Drive	. 150 mA

RS 232 Output Talker Connection

TX_5	. TX Data Output
GND	. GND
Output Drive	. 10 mA

9.5.6 Serial Line 6

It is possible to receive RS422 or RS232 standard signal at 2400 or 4800 bps indifferently on TB12 (232+422_1).

RS 422 Interface Listener Connection

+ IN_6	. "A" Data Input
- IN_6	. "B" Data Input
GND	. "C" Ground
Input Load	. $\geq 3\text{ K}\Omega$

RS 232 Interface Listener Connection

- IN_6	. RX Data Input
GND and + IN_6	. Ground
Input Load	$\geq 3\text{ K}\Omega$

RS 422 Output Talker Connection

+ OUT_6	. "A" Data Output
- OUT_6	. "B" Data Output
GND	. "C" Ground
Output Drive	150 mA

RS 232 Output Talker Connection

TX_6	. TX Data Output
GND	. GND
Output Drive	10 mA

9.5.7 Serial Line 7

It is possible to receive RS422 or RS232 standard signal at 4800 indifferently on TB10 (422). Note that the circuit is able to receive at 4800 bps also with RS232 connection, but this is not a standard connection according to the IEC 61162-2 standard.

RS 422 Interface Listener Connection

+ RX_7	. "A" Data Input
- RX_7	. "B" Data Input
GND	. "C" Ground
Input Load	. $\geq 3\text{ K}\Omega$

RS 232 Interface Listener Connection

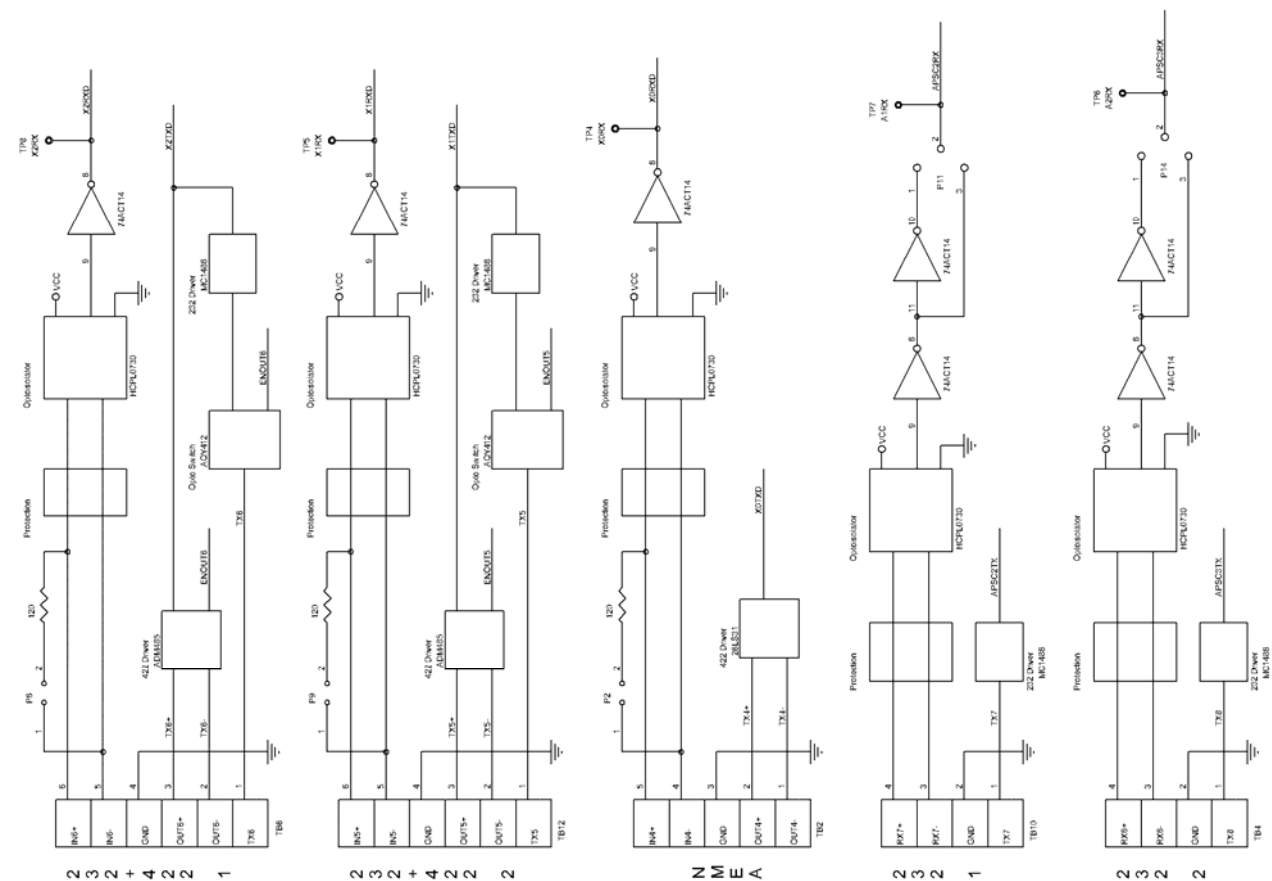
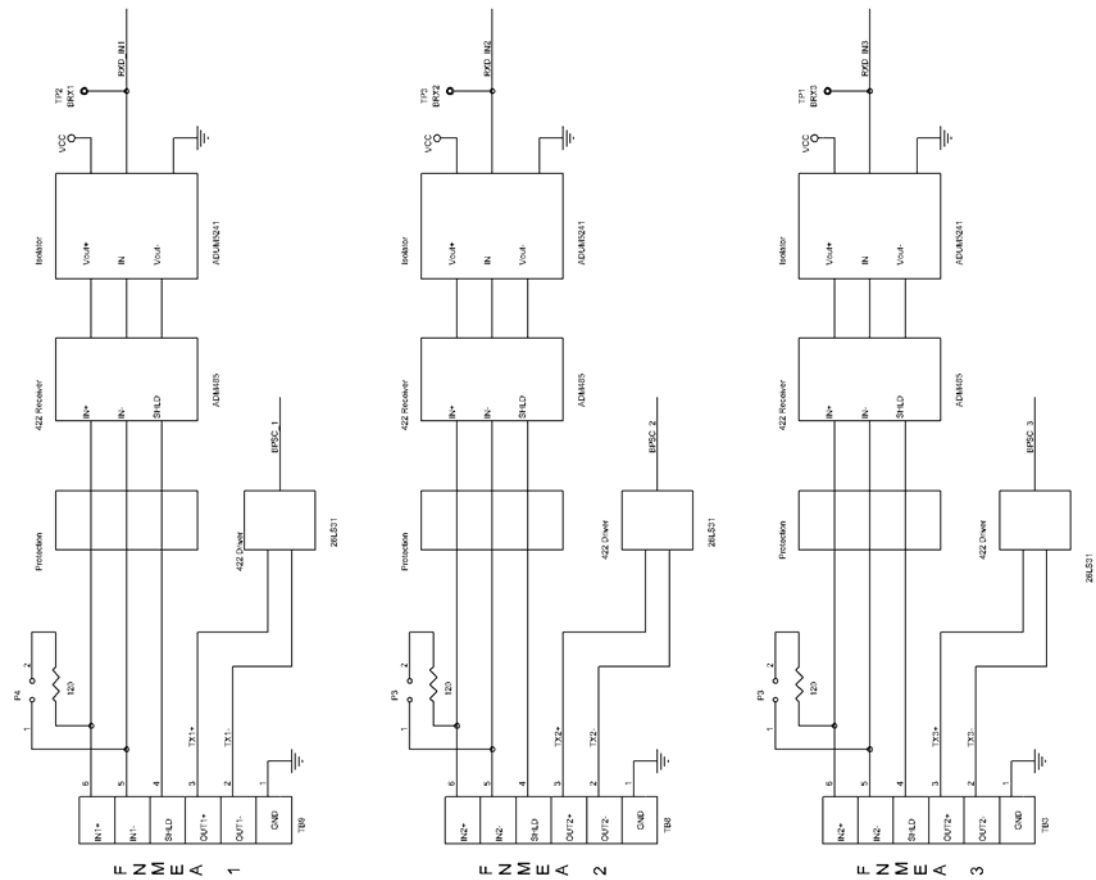
- RX_7	. RX Data Input
GND and + RX_7	. Ground
Input Load	$\geq 3\text{ K}\Omega$

RS 232 Output Talker Connection

TX_7	. TX Data Output
GND	. GND
Output Drive	10 mA

The output is the source of RAALR sentences.

Installation



9.6 INSTALLATION

The ARGUS Radar System is powered from ship's supply to its own built-in power supply, and communicates with the connected Transceiver(s).

9.6.1 Installation Principles

The ARGUS DISPLAY must be installed in an area protected against external weather conditions and far from heaters or any warm surface. The interconnecting cables shall be located in the best way and not obstructing the area. Special care is required to ensure access for maintenance.

To obtain the best working condition, we recommend that the room/area be provided with an air conditioning system, this also to provide a comfortable ambient temperature to operative and maintenance personnel. Temperature and Relative Humidity shall be kept within the limits of the Environmental Data as described above in par. 9.2 System Specifications.

9.6.2 Mechanical installation

The ARGUS Core Unit can be installed in the electrical locker, or in other accessible location on the bridge, respecting the environmental conditions. The ARGUS System shall be mounted by using the bolts/screws kits supplied with the units.

9.6.3 Electrical installation

The electrical installation in the ARGUS System consists of cabling and connection to connectors/terminals, (see terminal board pictures) as described below.

9.6.3.1 Power Supply Cable

The Power Supply Cable (core 3x1, 5 mm²) shall be connected to the CORE UNIT/INPUT MAIN LINE plug from the Ship's Main Line (115 or 230 Vac).

9.6.3.2 Keyboard Cable

The Keyboard Cable shall be connected to the Core Unit/J5 connector (SIRIUS Board). The yellow-green wire shall be connected to proper screw.

9.6.3.3 DVI Cable

The DVI Cable shall be connected between the Core Unit/J11 connector (SIRIUS Board) and Monitor/DVI connector.

9.6.3.4 Monitor Power Cable

The Monitor Power Cable shall be connected between MONITOR INPUT SUPPLY LINE plug and CORE UNIT/OUTPUT MONITOR LINE socket.

9.6.3.5 Grounding

The grounding point is located at the bottom of the units. The ground binding strap should be a tinned braided copper wire ($>25 \text{ mm}^2$) connected to the ship's ground.

9.6.3.6 Installation Check-out

After wiring connections, and before closing the CORE UNIT, the following procedures and controls must be carried out to prevent any failure due to incorrect installation:

- Clean the circuit boards with an antistatic brush
- Use a vacuum cleaner to remove any possible particles from the cabinets
- Check for proper cable bends to ensure a proper amount of slack
- Check that ground connections are duly tightened as well as terminal connections on the terminal boards
- Check if cable holders have a firm grip around the cables

9.7 INSTALLATION PICTURES AND DRAWINGS

The following figures and drawings are included after this page:

- Figures 9.7.1, 9.7.2, 9.7.3, 9.7.4, 9.7.10, 9.7.11, 9.7.12, 9.7.13, 9.7.14, 9.7.15 (Outline drawings)
- Figure 9.7.5 (Cable lengths)
- Figures 9.7.6, 9.7.7, 9.7.8, 9.7.9 (Terminal Board Pictures)

Fig. 9.7.1 – ARGUS DISPLAY – 19” Monitor outline drawing

All dimensions are in mm Weight 17÷21 Kg IP 65

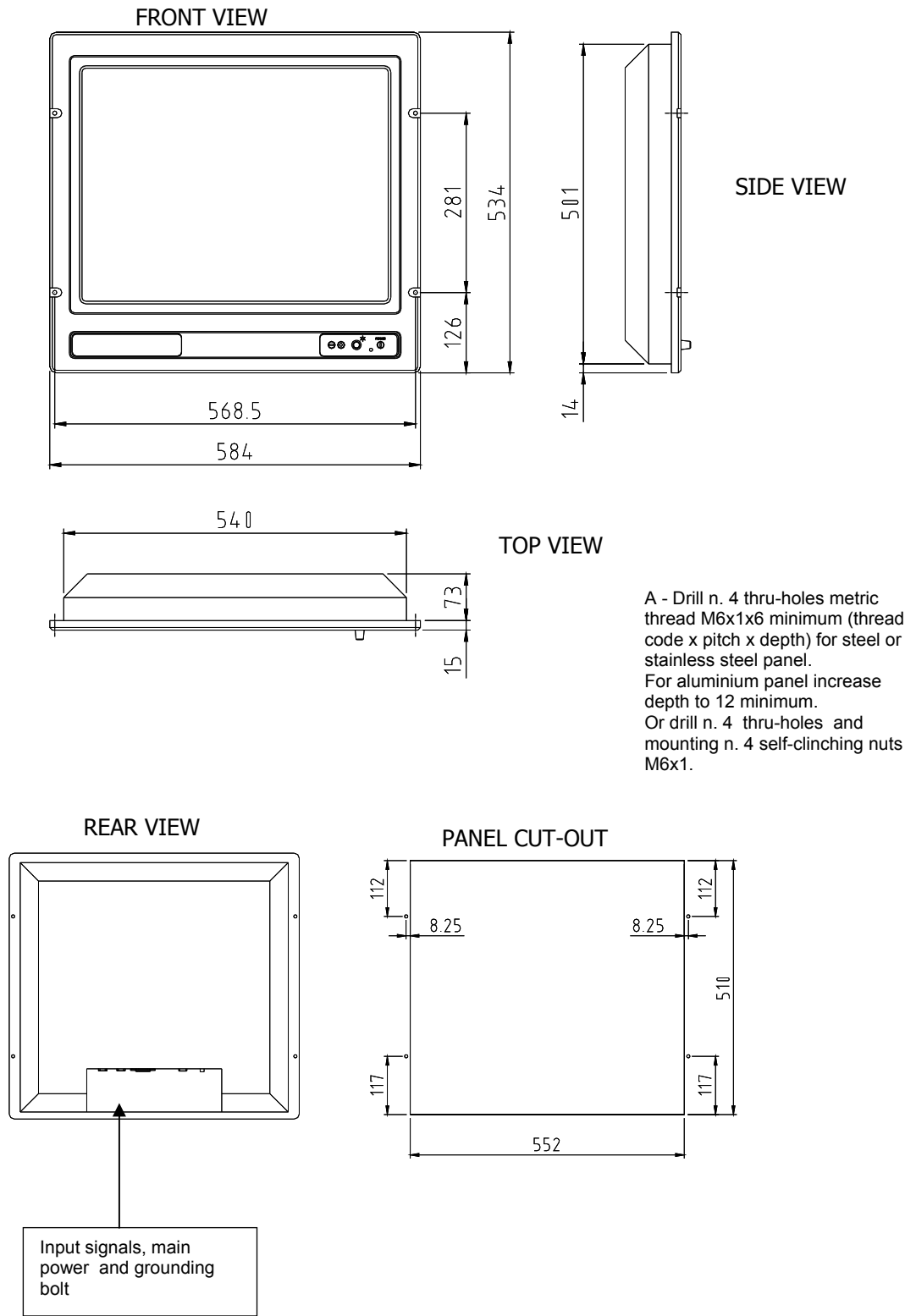


Fig. 9.7.2 – ARGUS DISPLAY – 23.1” Monitor dimensional drawing

All dimensions are in mm

Weight 12÷16 Kg

IP 65

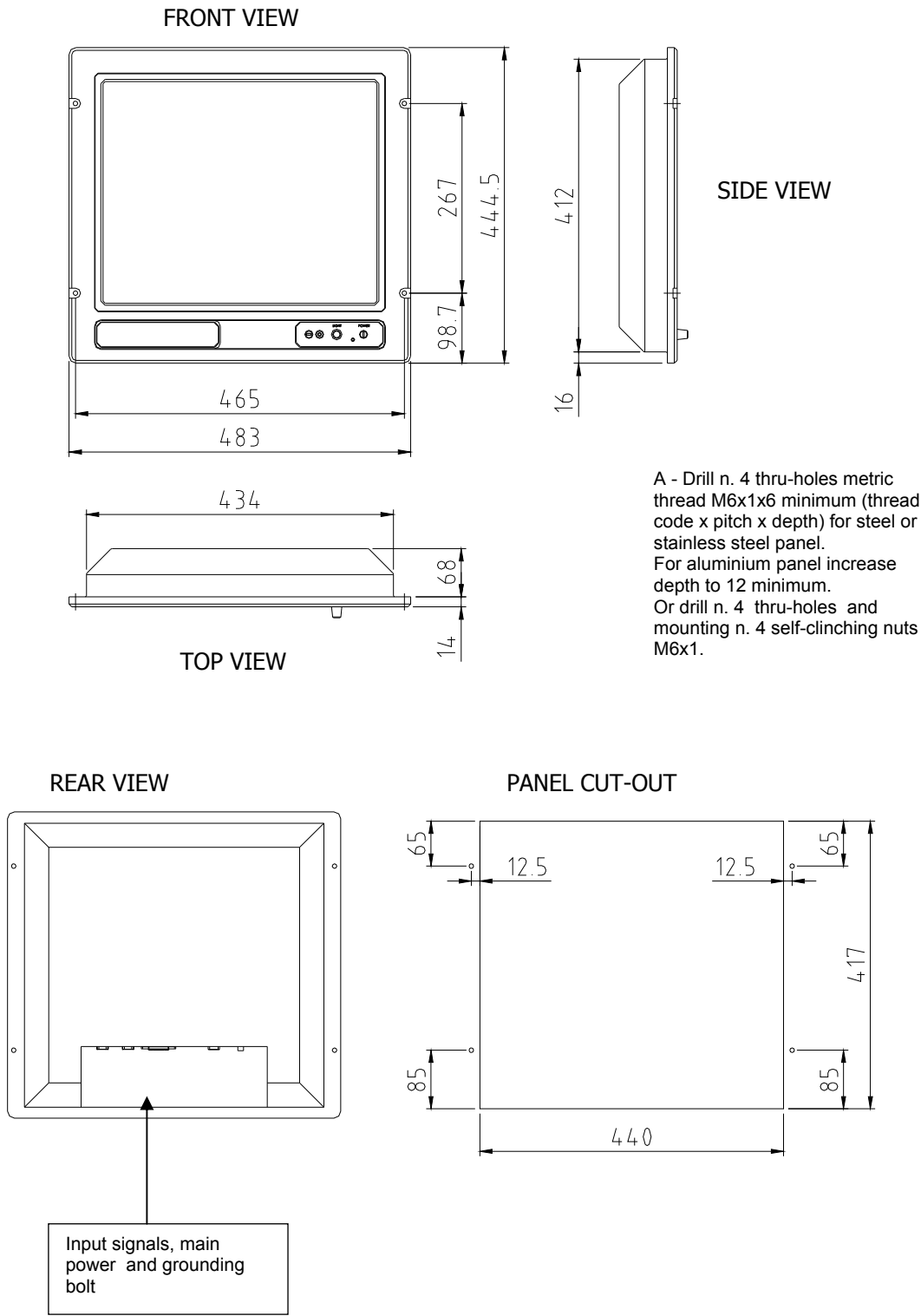


Fig. 9.7.3– ARGUS DISPLAY – 27” Wide Screen Monitor dimensional drawing

All dimensions are in mm

Weight 16 Kg

IP30

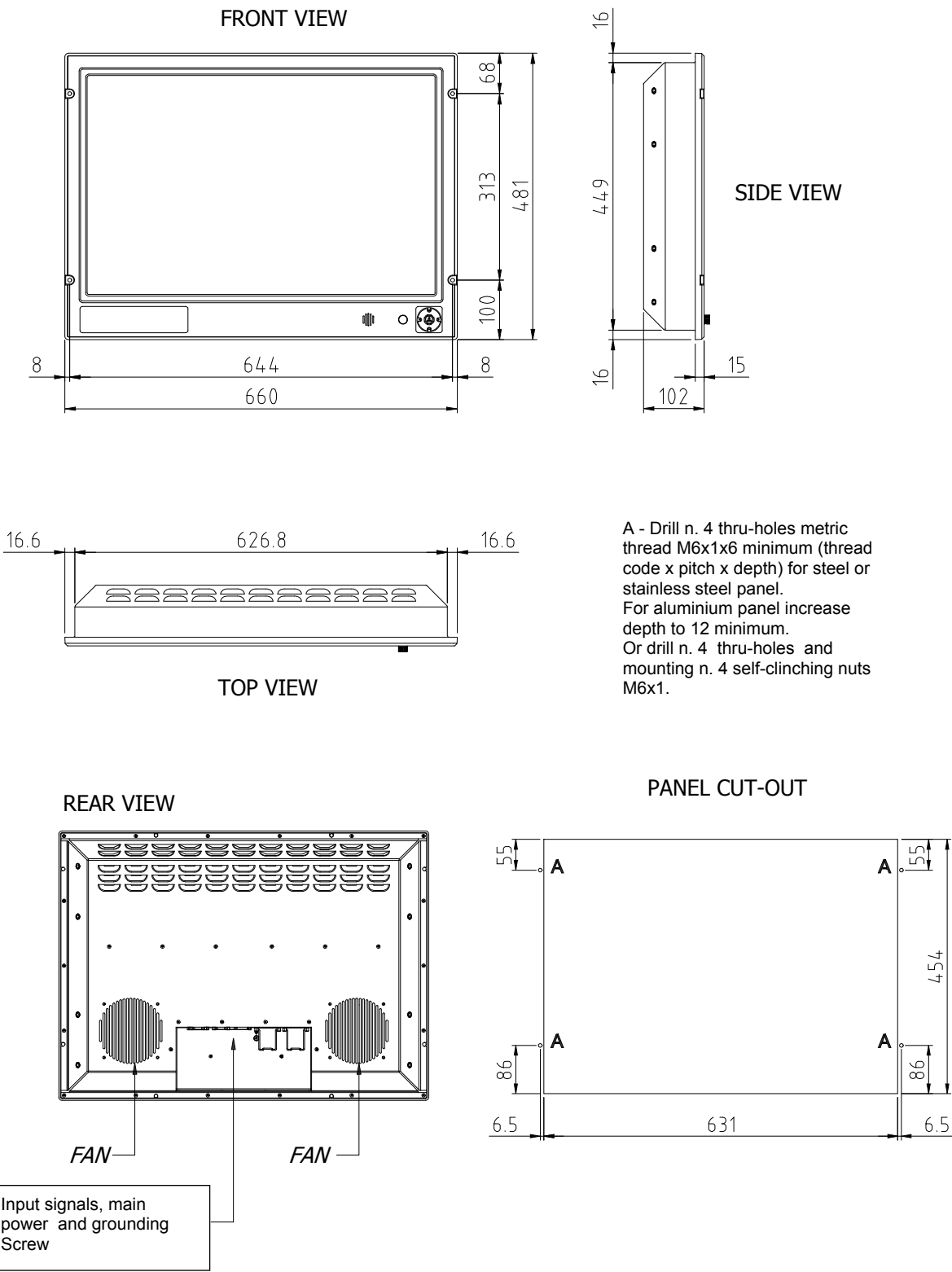
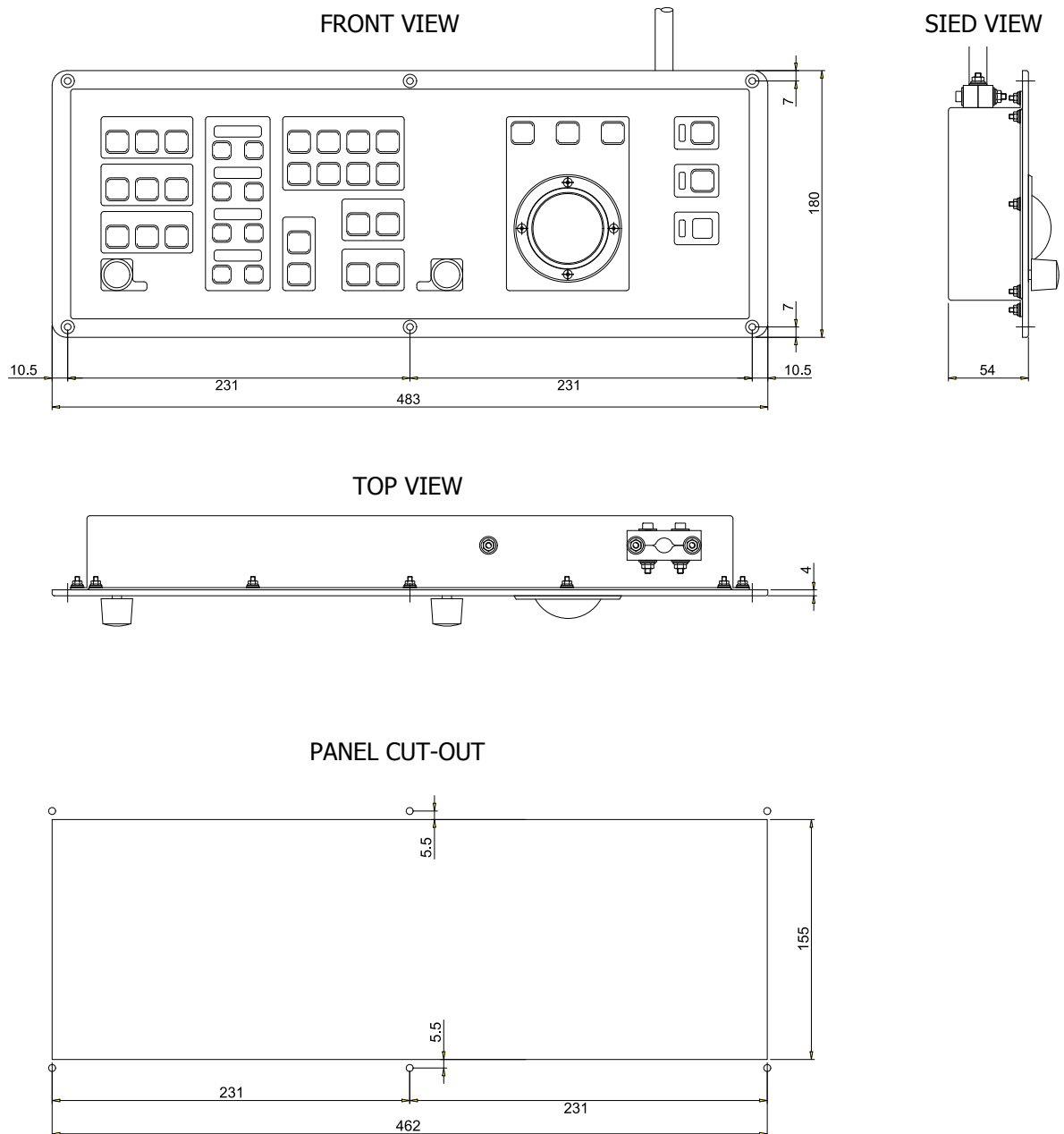


Fig. 9.7.4 – ARGUS RADAR SYSTEM – Control Panel dimensional drawing

All dimensions are in mm

Weight 2 Kg

IP 64

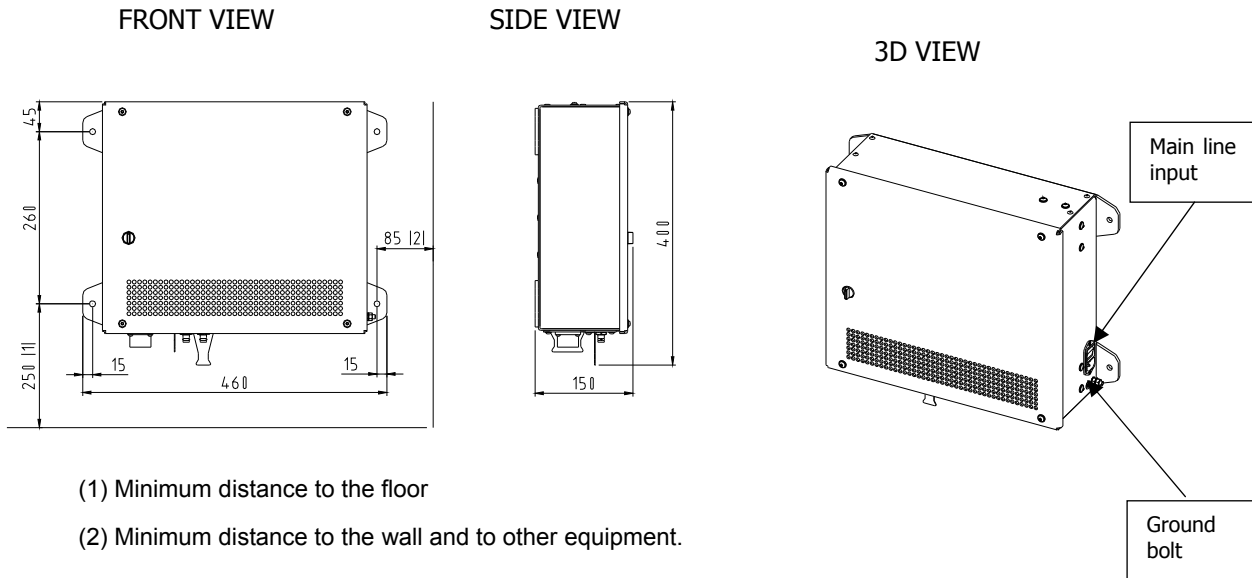


Drill 6 holes, metric thread M4x0.7x4 minimum (thread code x pitch x depth) for steel or stainless steel panel. For aluminium panel depth should be 8 mm minimum. Or drill 6 holes and mount 6 self-clinching nuts M4x0.7 in the panel.

Fig. 9.7.5 – ARGUS RADAR SYSTEM – CORE UNIT outline drawing

All dimensions are in mm

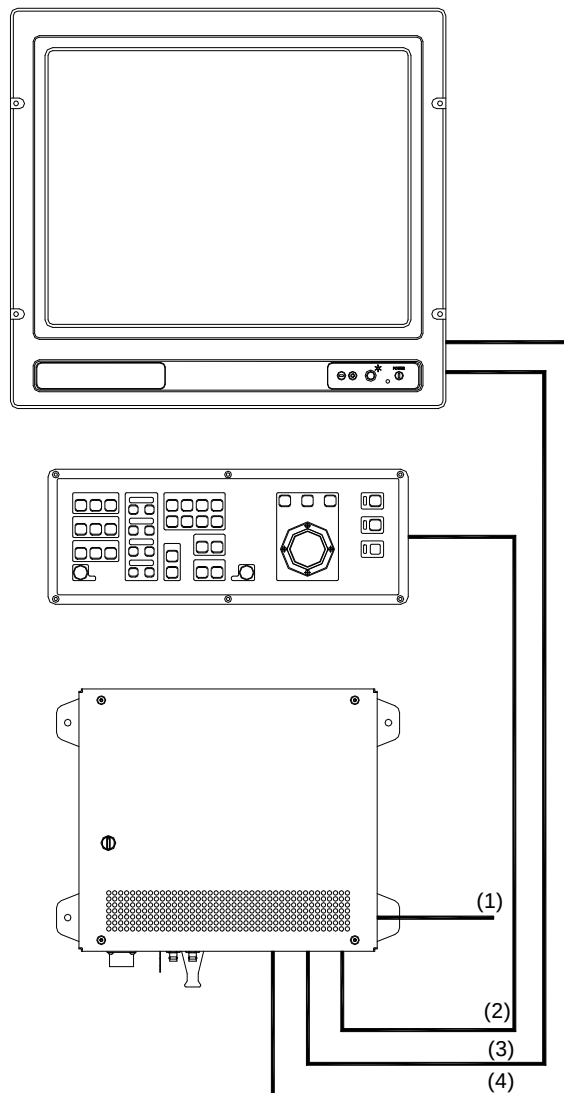
Weight 9 Kg IP 20



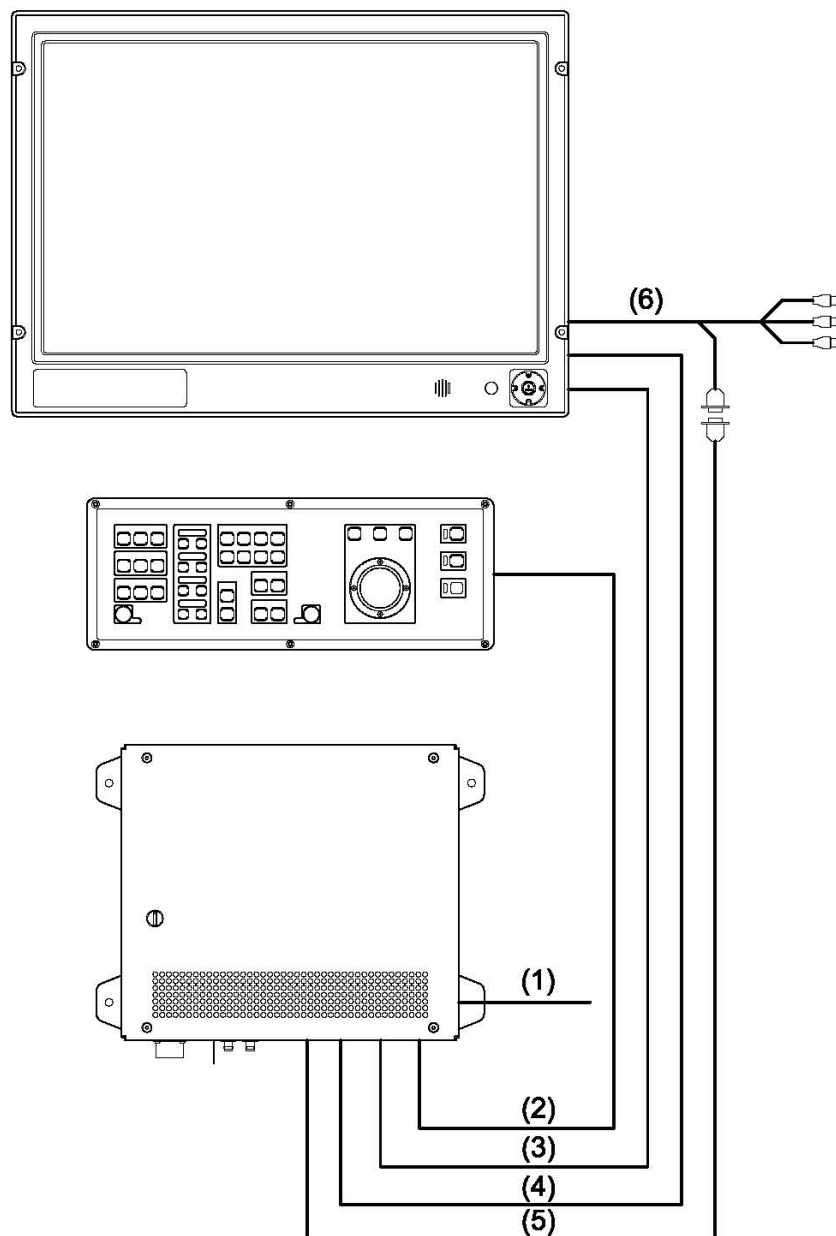
For installation drill 4 holes $\varnothing 12$ or

Drill 4 holes metric thread M8x1.25x8 minimum (thread code x pitch x depth) for steel or stainless steel support. For aluminum support depth should be 16 mm minimum.

Fig. 9.7.6 – ARGUS-19” and 23.1” DISPLAYS – Cable lengths



- (1) Main line cable - max length 2 m.
- (2) Keyboard cable - max length 3 m.
- (3) Monitor line cable - max length 3 m.
- (4) DVI cable - max length 3 m.

Fig. 9.7.7 – ARGUS-27" WS DISPLAY – Cable lengths

(1) Main line cable –max length 2 m.

(2) Keyboard cable – max length 3 m.

(3) Monitor line cable – max length 3 m.

(4) DVI cable – max length 3 m.

(5) Monitor control cable – max length 3 m.

(6) Multi cable – max length 30 cm.

Fig. 9.7.8 –CORE UNIT internal view

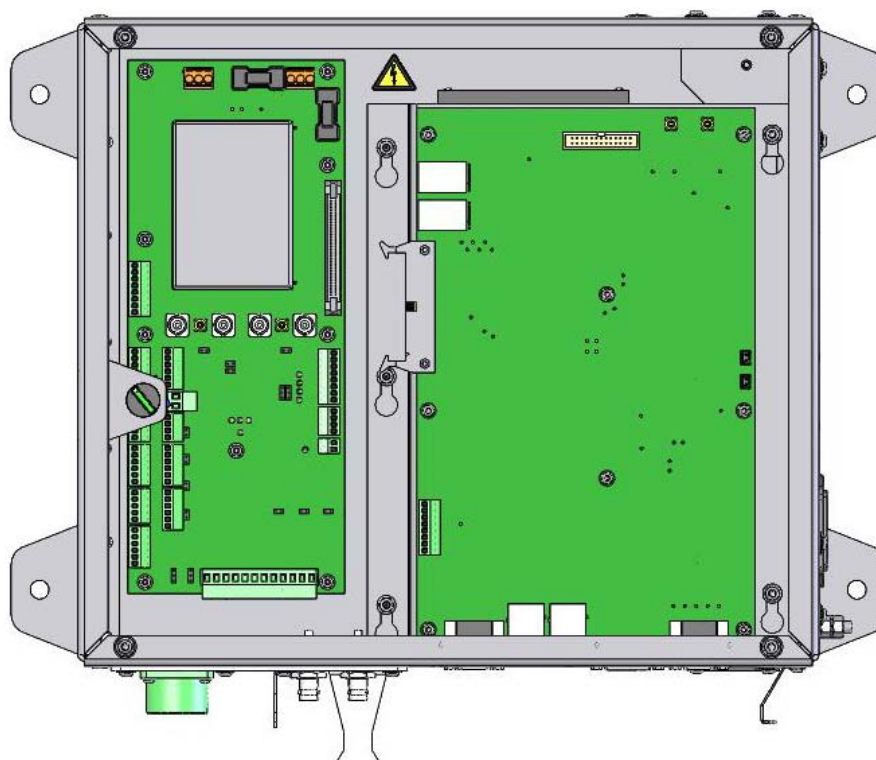


Fig. 9.7.9 CORE UNIT bottom view

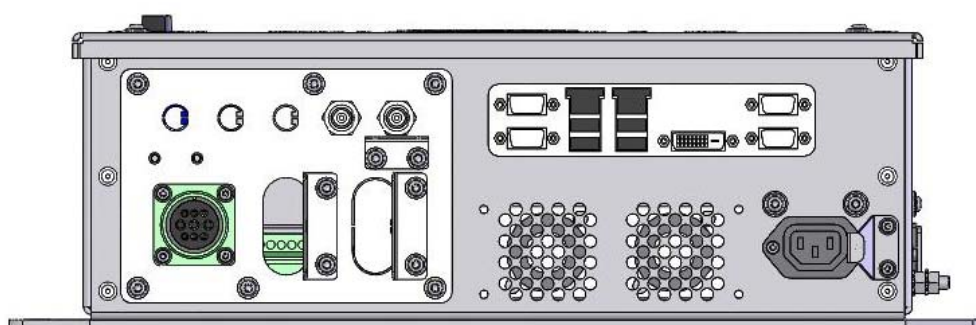


Fig. 9.7.10 CORE UNIT side view

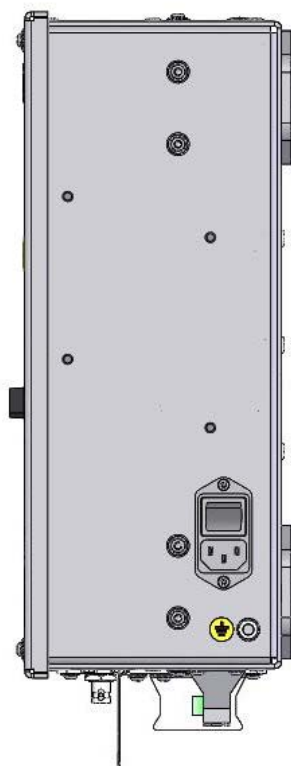
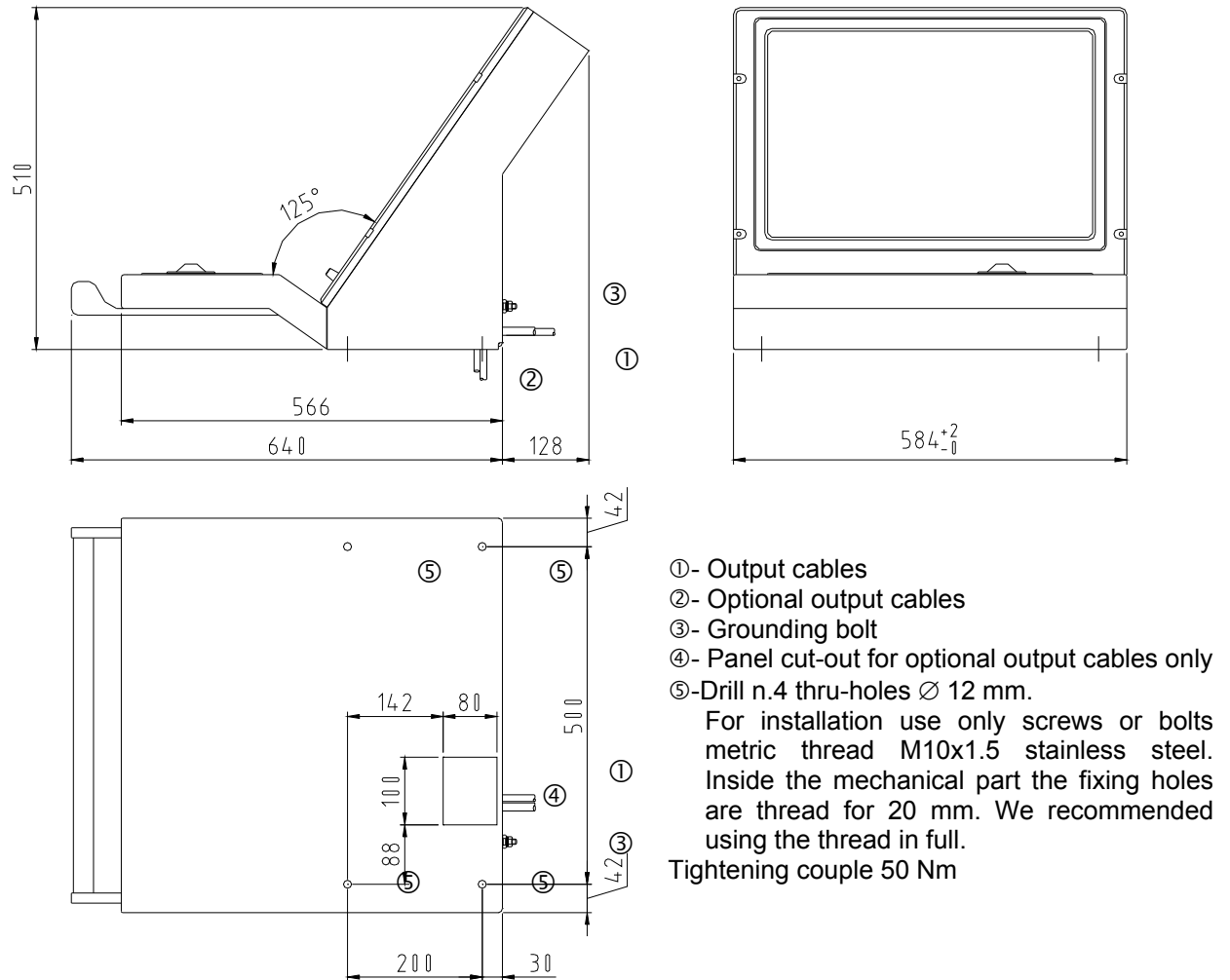


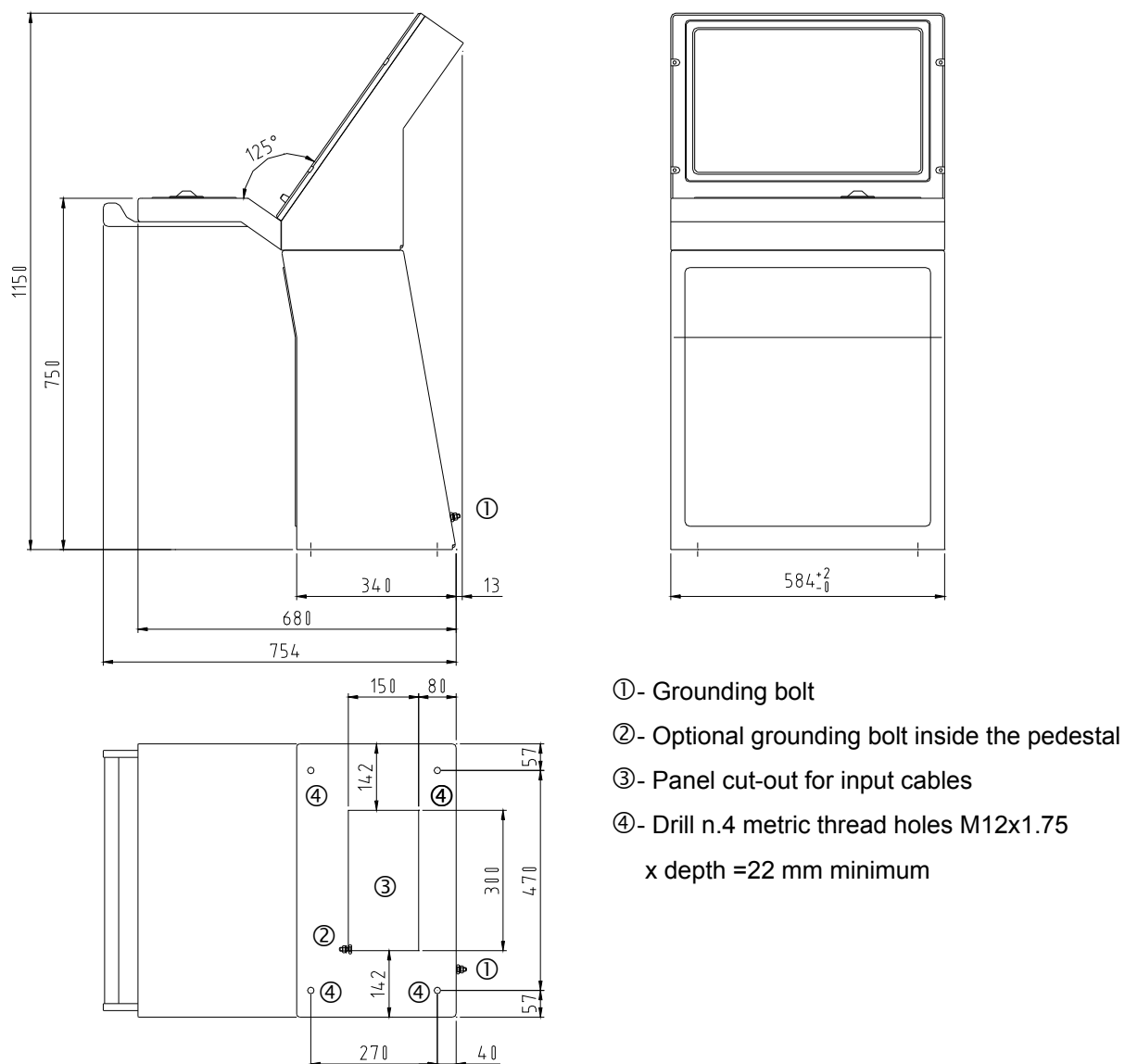
Fig. 9.7.11 ARGUS 19" and 23.1" DISPLAYS Desk Mounting Version Outline Drawing

Weight 34-39 Kg (19"), 37-42 Kg (23.1")

IP 20

(Monitor and Keyboard mounted on the desk mechanical part)

All dimensions are in mm

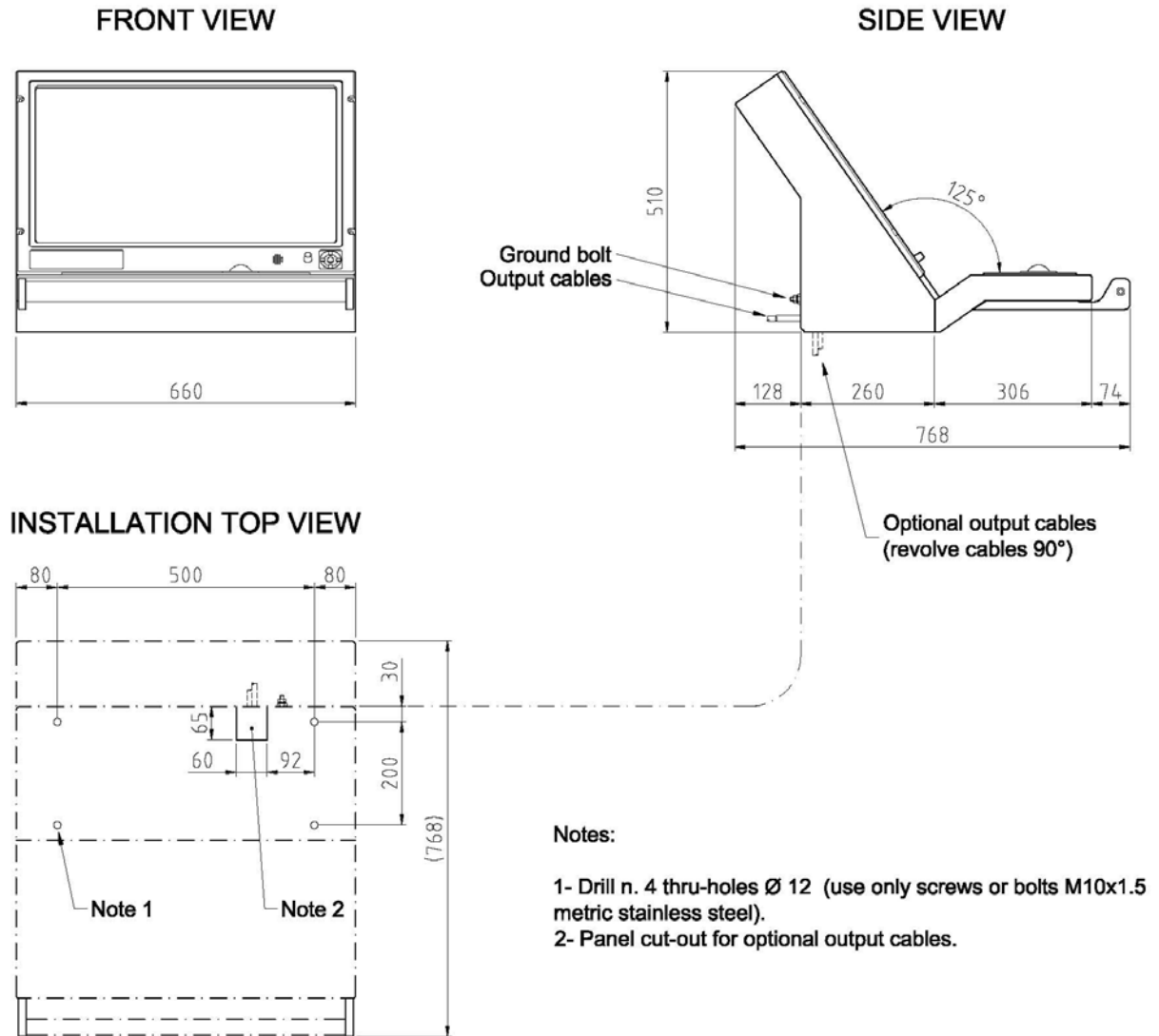
Fig. 9.7.12 ARGUS 19" and 23.1" Deck Mounting Version Outline Drawing

Weight 60-64 Kg (19"), 64-68 Kg (23.1")

IP 20

All dimensions are in mm

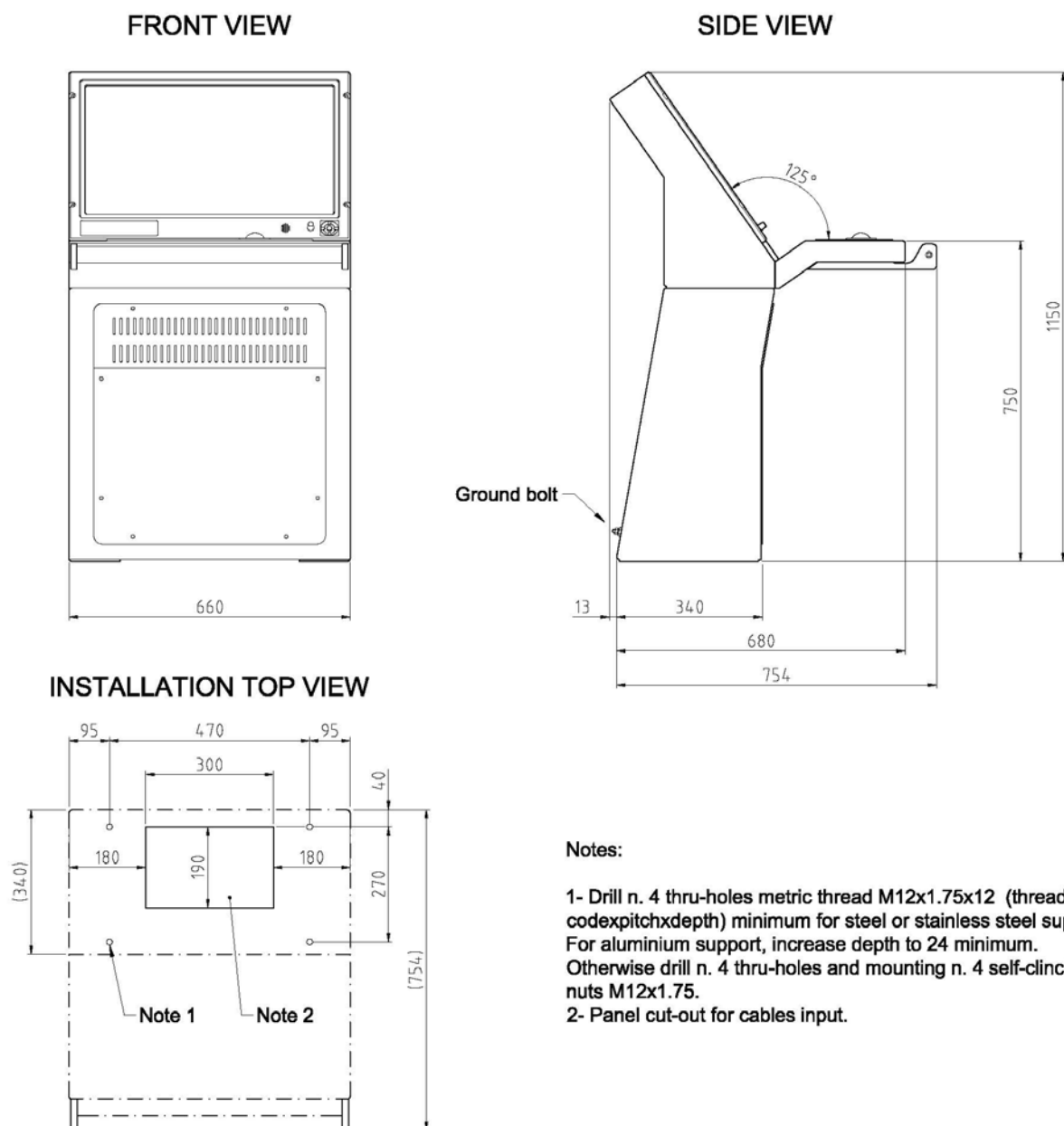
Fig. 9.7.13 ARGUS-27" WS DISPLAY Desk Mounting Version Outline Drawing



Weight 38 Kg IP 20

(Monitor and Keyboard mounted on the desk mechanical part)

All dimensions are in mm

Fig. 9.7.14 ARGUS-27" WS DISPLAY Deck Mounting Version Outline Drawing

Weight 65 Kg IP 20

All dimensions are in mm

In the following picture shows the terminal board (TB1) located at the bottom of the pedestal, used for ARGUS DISPLAY deck mounting ship's main line connection.

